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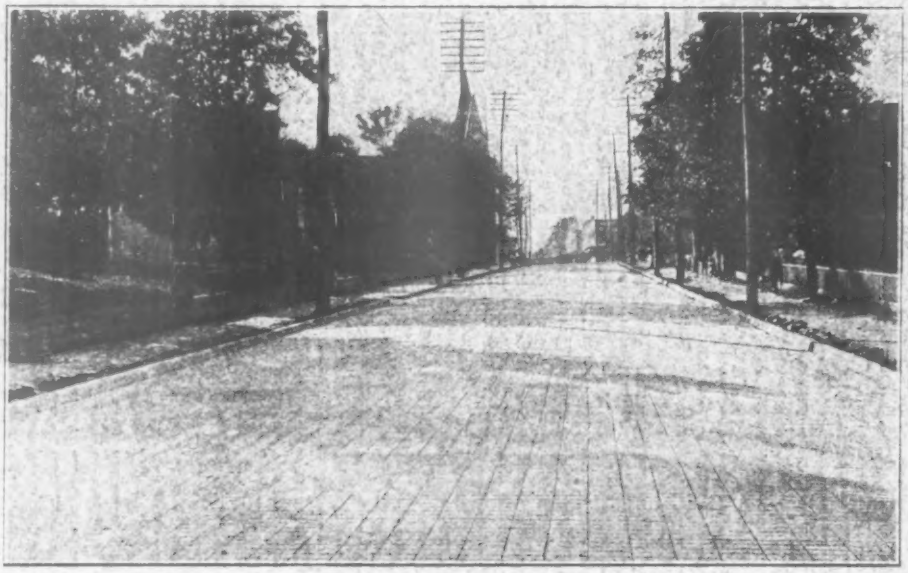

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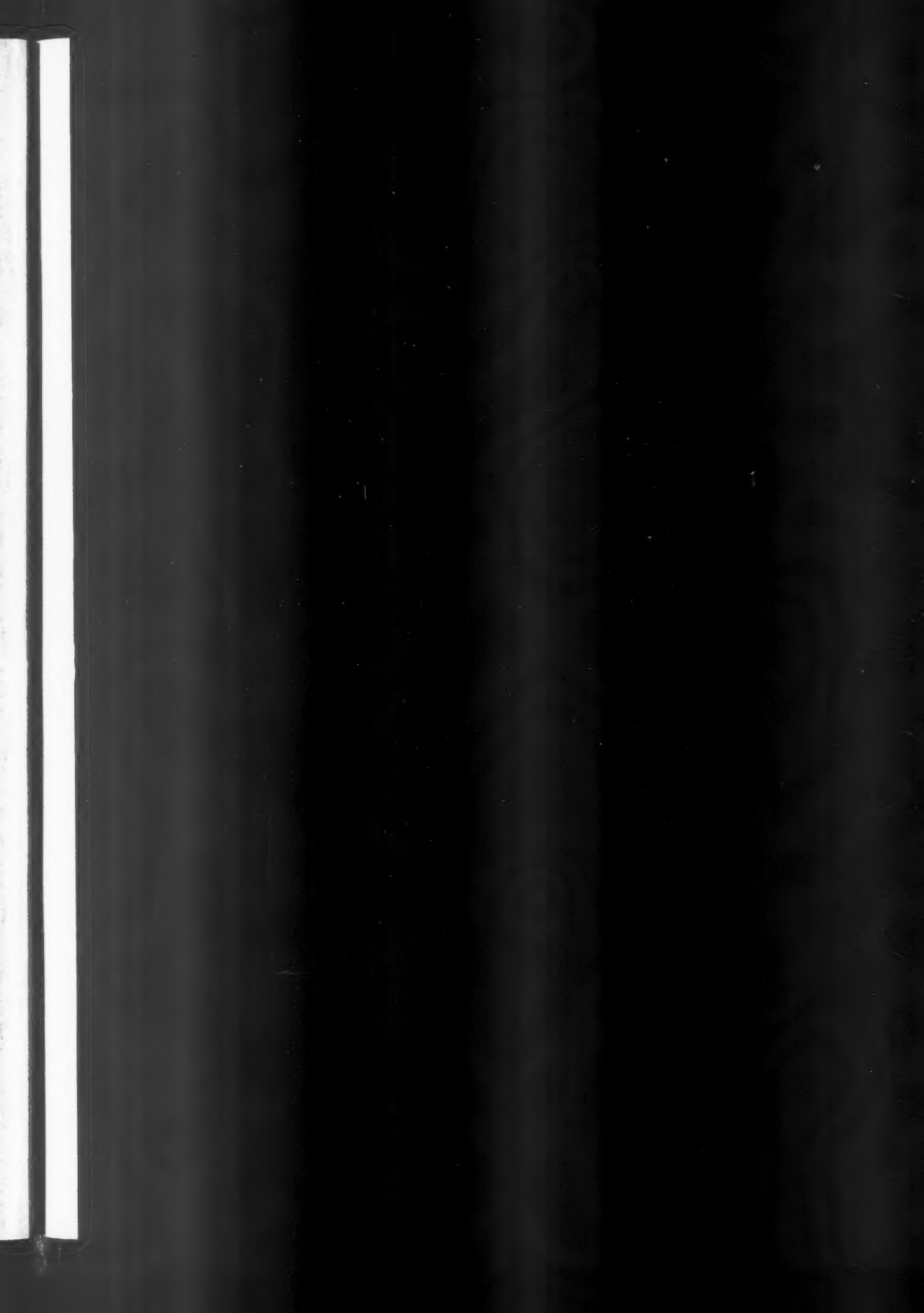

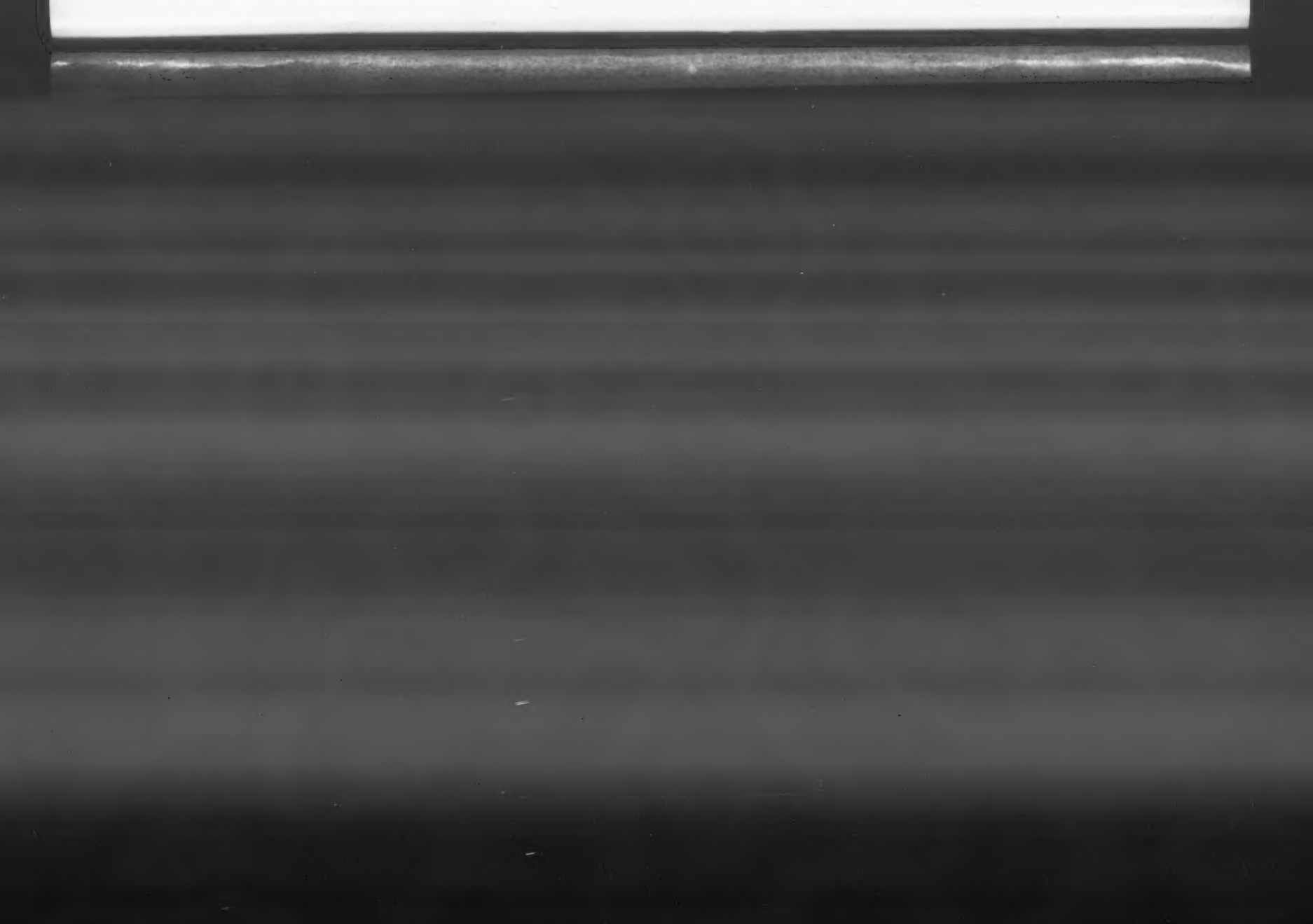

MUNICIPAL ENGINEERING

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PREPARATION OF ASPHALT PAVING MIXTURES.*

By Isaac Van Trump, Chemist in Charge of Chicago Branch of New York Testing Laboratory.

THE crude asphalt is refined or dried in large steam-heated and steam-agitated tanks, heated to about 320 degrees F., to evaporate off the moisture, which, in Trinidad Lake asphalt, is about 29 per cent of the crude asphalt. Any vegetable or other foreign matter, which occasionally appears in small quantities, is skimmed from the surface, and the remaining material, known as refined asphalt, is drawn off into barrels, permitted to solidify by cooling, and is then shipped to the hundreds of paving plants and plants where it is used for other purposes, situated in nearly every part of the civilized world.

At the paving plant the asphalt, refined or dried as described, is stripped of its barrel, broken into small pieces, thrown into another steam-heated and steam-agitated tank and again melted at a temperature not exceeding 325 degrees F., after which a quantity of flux or softening agent is added and the whole mixed into a homogeneous, viscous liquid. The object of the agitation is not merely to mix thoroughly the asphalt and oil, but also to keep any natural mineral matter contained in the refined asphalt evenly distributed, so that the material in all parts of the tank will have the same physical and chemical analysis.

The flux to be used can be either of an asphaltic, semi-asphaltic or paraffine base, depending upon the nature of the refined asphalt to be softened.

When the asphalt and oil are thoroughly mixed the resulting product is known as asphalt cement. Before any of this asphalt cement is used, a sample is drawn into a small round tin box three-fourths of an inch in depth and holding about 3 ounces. The sample is permitted to harden by cooling, after which it is immersed for thirty minutes in water maintained during the entire period at 77 degrees F. in a room having a like temperature. The sample is then subjected to the penetration test to ascertain its consistency.

There are several instruments by which the consistency can be determined, but the most modern and one of the most satisfactory is the New York Testing Laboratory penetrometer, and is operated in the following manner: The sample to be tested, after being maintained at a temperature of 77 degrees F. for thirty minutes, is placed on the table of the penetrometer, which is supported upon a screw, thus enabling the sample to be raised or lowered as desired. Supported by a vise or clamp directly above the sample is a vertical rod, holding in its lower end a No. 2 needle, the point of which is brought into contact with the sample. The vertical rod also carries a removable 50-gramme weight, making the total weight of the rod, weight and needle exactly 100 grammes. Above, but connected with the vertical rod, is a hand that revolves before a dial marked in tenths of millimeters. The position of the hand is noted, after which a button in the clamp is pressed and held for just five seconds, thus permitting the needle to sink into the sample for that period of time. The position of the hand before the dial is again noted, and the distance traveled by the hand is the degree of penetration or consistency. This is repeated four or five times. If the asphalt cement is still hard, more flux is added to the material in the tank, the entire

*From an address at the University of Notre Dame, Ind.

mass agitated fifteen or twenty minutes and another sample drawn and the consistency ascertained as before. This process is continued until the proper penetration for the work in process of construction is secured, depending upon the character of traffic, climate, width of street, etc.

While the work of bringing the asphalt cement to the proper consistency is in progress, sand is being fed to elevators, which in turn introduce it into one end of one or more large cylindrical iron drums which are revolving over a fire. The sand passes slowly through the drum, emerging at the other end at a temperature of about 345 degrees F., to be again carried up by elevators to a storage bin, or hopper, from which it is drawn through a pipe to a mixing platform, where an iron box, resting on a scale or capable of holding a fixed amount by weight, as the case may be, is filled, a specified amount of dust or filler having first been deposited in the box. Thus the exact weight of sand and filler is secured.

The object of this dust is to fill the voids in the sand, causing the surface mixture to be more stable and dense. For streets of heavy traffic, 13 or 14 per cent of material passing the 200-mesh sieve is required, but for streets of light traffic 10 or 11 per cent is usually sufficient. An excess of filler will cause the mixture to become bally when raked and an insufficient amount will make the surface creep during the hot weather, thus producing a wavy street, caused by the fact that the voids in the sand are filled with asphalt cement instead of dust. There are various kinds of material used for this purpose, such as powdered limestone and oyster shell, Portland and natural cements, etc. Limestone is almost universally used, though Portland cement is best adapted for heavy traveled streets.

While the sand box is being filled with the sand and filler, a skilled workman, known as the "mixer man," draws through an asbestos-covered pipe the asphalt cement from the tank to the mixer platform, where the proper amount is weighed into a swinging bucket suspended from a scale.

We now have all three of the ingredients which are necessary to produce an asphalt surface mixture, assembled on the mixer platform; the sand and dust in the sand box and the asphalt cement in the swinging bucket. Situated between the two is the mixer itself. It is a steam-jacketed iron box, shaped like a half cylinder reclining on its side. Passing through this box from end to end are two pieces of shafting, each provided with teeth or paddles. By means of gears at the ends, these shafts revolve in opposite directions, making about 68 or 70 revolutions per minute. Into this mixer the sand and dust is dropped through a gate in the bottom of the sand box and, after being churned or mixed by the paddles for eight or ten seconds to thoroughly mix the dust with the sand, the asphalt cement is poured in and the churning continued for about one and a half minutes, or until the entire batch is a homogeneous mass. A gate in the bottom of the mixer is then opened by the mixer man and the batch of finished surface mixture is dropped into the wagon beneath and is ready to be hauled to the street. The temperature is about 315 degrees F. if Trinidad asphalt is used.

A standard mixture prepared in this way should approach as nearly as local conditions permit to the following analysis:

	Per cent.
Bitumen	10.5
Sand passing 200-mesh sieve	13.5
Sand passing 100-mesh sieve	13.0
Sand passing 80-mesh sieve	13.0
Sand passing 50-mesh sieve	23.0
Sand passing 40-mesh sieve	11.0
Sand passing 30-mesh sieve	8.0
Sand passing 20-mesh sieve	5.0
Sand passing 10-mesh sieve	3.0
	100.0

The best surface mixtures are made with sand that is clean and free from loam and having a surface to which the asphalt cement will adhere satisfactorily. Samples of sand should be gathered at least every hour during the day from the sand box and tested for its grading by means of a series of sieves, eight in number, ranging from the 200-mesh sieve containing 40,000 openings to the square inch, to the 10-mesh screen having 100 holes to the square inch, a certain percentage passing through each sieve to produce as nearly as possible the following standard grading:

	Per cent.
Sand passing 200-mesh sieve	
Sand passing 100-mesh sieve	17.0
Sand passing 80-mesh sieve	17.0
Sand passing 50-mesh sieve	30.0
Sand passing 40-mesh sieve	13.0
Sand passing 30-mesh sieve	10.0
Sand passing 20-mesh sieve	8.0
Sand passing 10-mesh sieve	5.0
	100.0

If the test shows the sand to be varying materially from the desired grading, a change is immediately made in the feeding of the sand at

the elevators to produce the proper results.

The binder course, upon which the wearing surface is directly laid, is composed of broken stone that will pass through a 1-inch ring coated with asphalt cement like that used in the surface mixture, and is prepared in a similar manner, but without the use of a filler and with the paddles in the mixer being shorter and farther apart. A mixture known as close binder is replacing the ordinary binder in many cities and is similar to the latter, but with the addition of about 30 per cent of sand to fill the voids in the stone. This sand, requiring an extra amount of asphalt cement to coat same, makes the cost of this form of binder somewhat greater, but this is more than counterbalanced by the reduced amount of maintenance, as this close binder will, if necessary, support traffic, and thus act as a wearing surface. The ordinary open binder has not as great supporting power, besides permitting a large amount of the surface mixture to be pressed down into the interstices of the stone and lost. This is all saved when close binder is used and the asphalt surface is prevented from creeping on smooth concrete and producing a wavy street after opening same to traffic.

The method of laying the pavement will be given in a subsequent article taken from the same address.

THE MUNICIPAL ASPHALT PLANT OF DETROIT, MICH.

By Len G. Shaw, Detroit, Mich.

IT is now five years since Detroit installed the first municipal asphalt plant in the United States. This move was made only after the most bitter opposition in certain quarters, and in the face of dire predictions of financial loss to the city. Because of the conditions that preceded its coming, the record established during these five years possesses added interest.

In 1903 the services of Mr. Clarence A. Proctor were secured through Mr. A. W. Dow, formerly inspector of asphalt and cements for the District government at Washington, D. C., Mr. Proctor acting as inspector of contract work. He was a consistent advocate of a municipal asphalt plant, but his suggestions received little encouragement in official quarters. Finally, in the spring of 1904, at the recommendation of former Commissioner of Public Works Wm. H. Maybury, a plant manufactured by Hetherington & Berner, of Indianapolis, rated at 1,500 square yards of 2-inch topping compacted Trinidad asphalt per day of ten hours was installed. Mr. Proctor was placed in charge, having had direct supervision to date, and to him is largely due the credit for what has been accomplished.

The plant was a success from the outset, and in 1905 it was decided to add a one-car portable Hetherington & Berner plant, with a rated capacity of 1,000 yards a day, to be operated in conjunction with the stationary plant. In 1907, through the addition of two melting tanks, the capacity of the latter was increased to at least 2,000 square yards per day.

Owing to the inability to secure a suitable location for its operation within a reasonable distance from the work, the portable plant was sold in 1908. Following this action, Commissioner of Public Works J. J. Haarer, among the staunchest advocates of a municipal plant when an alderman, recommended that in order to make up for the lost capacity through this sale an extension be made to the stationary plant. This was done by installing a Cummer plant, increasing the capacity at least 1,500 square yards per day, and making the total output of the entire plant 3,500 square yards of 2-inch topping compacted Trinidad asphalt on a basis of ten hours per day.

The first year 40,000 yards of asphalt was laid; in 1908 this was increased to more than 200,000 yards. Since the plant first began operations there have been laid 572,098 square yards of asphalt. Of this 329,636.75 yards were resurfacing, 104,089.31 repaving, and 138,371.94 city and private patching. The repaving and resurfacing called for 1½ inches of binder and 2 inches of topping compacted, and the patching average was 3 inches, mostly topping. This is considerably more asphalt than is

used in many cities, a fact that must be borne in mind in making comparisons.

In accordance with charter requirements, proposals were asked for all paving. The figures were so high, however, that they were rejected, concrete and curbing contracts being let, and the city laying the asphalt. During the last two years all work has been done in this manner. The lowest average contract price on resurfacing was $1.23 per square yard, a total for the 329,636.75 yards laid of $405,453.52. This the city laid for $377,190.95, including all overhead expenses and a liberal allowance for maintenance, the net saving to the municipality being $28,262.57. On repaving the lowest average was $1.30, or $135,316.10 for the amount done. The same work performed by the city cost $109,479.74, a saving of $25,836.36. Of city and private patching there was 138,371.94 square yards, for which contractors wanted an average of $1.12, or $154,976.57. The city laid this for $126,159.09, thereby saving $28,817.48. Thus in five years the net saving to the city on these three items was $82,916.41.

This showing is based upon actual cost to the city, and where there were no actual expenditures or losses, such as interest, rent, water, lights or taxes, these items were not taken into consideration. For comparative purposes, and to afford no opportunity for criticism, $8,362.90 may be set aside as interest on the investment for five years, $2,031.65 for taxes for a like period, $3,000 for rent, and $500 for water and light, a total of $13,894.55. Deducting this from the figures given above, it will be found that there still remains a net saving to the city of $69,021.86.

For the purpose of comparison, the following itemized statements are given:

EXPENDITURES, TABLE "A."

Capital Expenditures:		
Buildings	$ 2,230.94	
Plant	24,702.55	
Portable plant	9,716.39	
Equipment	11,070.37	
Small tools	1,811.53	
Laboratory and office	1,188.94	
Total capital expenditures		$50,720.72
Operating Expenses:		
Salaries expert and assistants	$13,774.51	
Sundry expense items	779.41	
Repairs and renewals	4,343.97	
Total operating expenses		$18,897.89
Total expenditures, except material and labor at plant		$69,618.61

EXPENSES, TABLE "B."

Salaries of expert and assistants	$13,774.51	
Sundry expense items	779.41	
Repairs and renewals	4,343.97	
	$18,897.89	
Less portion of salary of asphalt expert for years 1904-5-6, chargeable to inspection of contract work	3,500.00	$15,397.89
Loss on sale of portable plant:		
Cost	$9,716.39	
Depreciation two years	1,943.28	
	$7,773.11	
Sold for	$5,000.00	$ 2,773.11
Estimated depreciation on capital expended:		
First year on $17,969.57 investment	$ 1,796.96	
Second year on $25,923.81 investment	2,592.38	
Third year on $35,238.97 investment	3,523.90	
Fourth year on $42,404.85 investment	4,240.49	
Fifth year on $45,720.72 investment	4,572.07	
On borrowed equipment for five years	1,705.00	$18,430.80
Total expenses for five years		$36,601.80

CREDITS, TABLE "C."

SQUARE YARDS PRIVATE PATCHING AND AMOUNTS RECEIVED FOR SAME.

Year.	*Sq. Yds.*	*Amt. Recd.*		
1904	10,327.88	$10,241.72		
1905	5,188.88	7,340.83		
1906	6,162.78	9,170.78		
1907	7,387.49	11,115.01		
1908	11,055.79	16,009.28		
Total	40,122.82	$53,877.62		
Cost to city $1.01237 per sq. yd.		40,619.14		
Net profit to city		$13,258.48		
Less demurrage 1906		139.00		
			$13,119.48	
Sale of empty oil barrels, gravel, use of rollers, etc.			902.42	
Use of plant by contractors			200.00	
Repaving for contractors			1,314.65	
Sale of mixture to contractors for patching			379.00	
Overage Venezuelan asphalt accounted for in former reports			160.03	
Allowance for fittings to tank car, extra labor and unloading			28.90	
Error in California oil charged 1906			308.99	
				$16,413.47

In computing the charges, cost of labor has been based on eight hours per day, foremen receiving $4 daily, rakers $3, smoothers and tampers $2.50, roller men $3.50, watchmen $2.25, laborers $1.75, and teams $4.

The following table shows the cost per square yard to the city under varied conditions:

Kind of Work.	Labor and Material.	Overhead Charge Table "B."	Total Cost Exclusive Maintenance.	Total Cost Five Years' Production Exclusive Maintenance.	Less Credits Table "C."
Resurfacing	$0.883	$0.06397	$0.94697	$312,156.11	$ 892.51
Repaving	.83805	.06397	.90202	93,890.64	1,596.45
Patching	.9484	.06397	1.01237	140,083.60	13,924.51
				$546,130.35	$ 16,413.47

Kind of Work.	Net Cost Square Yard Exclusive Maintenance.	Net Cost Exclusive Maintenance.	Ten Years' Maintenance. Square Yards.	Est. Reserve 20c Sq. Yd.	Total Cost Square Yard
Resurfacing	$0.94426	$311,263.60	329,636.75	$65,927.35	$1.14426
Repaving	.8866	92,285.19	*85,972.75	17,194.55	1.05178
Patching	.91174	126,159.09	**		.91174
		$529,707.88		$83,121.90	

*Difference 18,116.56 square yards laid for contractors and maintained by them.
**No maintenance on patching.

Not the least noteworthy feature in connection with the operation of the municipal plant is the fact that in addition to saving a tidy sum, the city has secured the best of pavements, there having been no maintenance whatever up to date, and all streets being in splendid condition.

A fruitful source of revenue to the city has been private and corporation patching, as shown in Table C. It was not long after the installation of the municipal plant until contractors who had maintenance agreements in force discovered it would be cheaper

to let the city keep the streets in repair, charging them for the work performed, than to bring expensive outfits each year to a city where they were getting little or no new work. In this manner the city, counting the difference between cost and charges on corporation patching, swelled its savings during the five years to the extent of $13,119.48.

SANITARY RAILROAD CONSTRUCTION CAMPS ON CEDAR RIVER WATERSHED, SEATTLE, WASH.

By Louis P. Zimmerman, Seattle, Wash.

THE western extension of the Chicago, Milwaukee & St. Paul Railroad has been attended with many new and interesting engineering achievements, both in the construction of the line and the methods of building it. Eleven miles of the road was built through the valley of the Cedar River, comprising part of the water shed which supplies water to the city of Seattle. This construction through Cedar River bed is unique in that it is probably the only railroad work in which the sanitary regulation of the construction camps has been under the charge of city or state health officers. The Milwaukee in building its western extension west through the State of Washington to Seattle and Tacoma, has obtained a very low grade over the mountains by driving various tunnels and making some contours of considerable length. The eleven miles through the Cedar River water shed form part, and a very interesting part, of their line in its low grade limit over the mountains.

In 1906, the Chicago, Milwaukee & St. Paul first made application to the city of Seattle for the right to build their road for a distance of eleven miles through the city water shed. After considerable delay and parley, a special commission consisting of Messrs. Abbott, Harrington and Sedgwick was appointed to investigate and report upon the feasibility of allowing the railroad to build through the water shed.

This commission reported in essence that the Milwaukee could enter the Cedar River drainage basin without menace to the purity of Seattle's water supply if certain rules for the construction and maintenance of the road be complied with. This was the beginning of the first and the most unique regulation of railroad camps. The rules recommended and adopted were in essence as follows:

1. A competent sanitary engineer with suitable assistance shall have full and complete authority over the construction camps.
2. The camps shall be located safely away from the vicinity of the river and shall not drain into it.
3. The camps shall be carefully cared for as regards the physical health of the men, with special provision for the purity of the drinking water and food supply.
4. Suitable provisions for the men at and near their work.
5. The systematic removal and destruction of all humane excrement.
6. The removal and destruction of garbage and kitchen waste.
7. Care of draft animals and careful collection of their droppings and the destruction thereof.
8. Provisions for bathing purposes.
9. Screening of kitchen and dining room to prevent ingress of flies which might tend to contaminate the food supply for the men.

The Seattle water supply being a direct supply drawn from the Cedar River, which has its tributaries in the Cascade Mountains, it is necessary to have a constant and vigilant patrol to protect the purity of the supply, as there is no settling basin. Cedar River is about 40 miles from Seattle and the watershed on both sides is owned by the city, which gives the city a means of controlling the nature of the discharge and the work in the basin. The Cedar River valley is narrow and rocky, and during the spring the river often rises 40 feet in some places, making it necessary to build the road bed above the high water mark. The sides of the Cedar River rise very abruptly and are almost entirely rocky soil covered with more or less timber. The ordinary rule that the cut shall approximately equal the fill was not observed in this work, but the road bed was made ¾

cut and ¼ fill, to get back from the river and prevent any washing of the fill work.

In locating and building the road, four construction camps were established at points along the river, in which about 400 men were cared for. In the regulations agreed upon for these camps, one chief inspector was maintained upon the work by the Milwaukee, who reported daily to Dr. Heg, Secretary of the State Board of Health, who has his office in Seattle. Dr. Heg made monthly trips to the work in person to inspect the camps and progress and sanitary conditions there. The city thus had at all times a comprehensive report and knowledge of the work in the watershed.

Each camp had a man who did nothing else but clean up refuse and garbage, which was immediately and completely destroyed in the temporary crematories built on the ground. The brick crematories (a typical one is shown in the cut), costing about $15 each, were built not less than 60 feet back from the river, and were used to destroy all horse manure, garbage, and kitchen waste of the camps. These crematories consist of a brick frame about 4 by 8 by 8 feet erected over a small pit, fitted with grates or bars of some kind on which to burn the refuse, a stovepipe chimney reinforced with angle iron and bars to give it strength.

All buildings were carefully screened to keep out the flies, to prevent contamination of food and drinking water. The bunk houses were washed out every day with a hose and water, or if there were two bunk houses in the camp, every other day. Provisions were made for bathing and the men were obliged to bathe at stated times, although it was rarely necessary to enforce this regulation, as the men soon saw the advantage of the camps. For the human urinary and fecal deposits, closets with removable bottoms were built for use when in or near the camps. These pans were removed and dumped upon the ground, covered with wood and burned, to destroy all vestige of the deposits. On the work, certain places back from the river were marked by the inspector where the men were allowed to urinate. These places were changed every two days, covered with wood and burned. Any man violating the instructions in regard to these places was promptly discharged.

REFUSE CREMATORY FOR CONSTRUCTION CAMP.

The total cost to the Milwaukee for the inspection was very little comparatively, being in principal, $150 a month for the chief inspector and $60 a lect the refuse. So thoroughly was the work done that during the whole period of construction only two cases of typhoid fever were found in camp, and these were contracted before coming to the camps, as they broke

out three days after coming to the camps. The only other men sick in camp were accidents or had sore feet. All men who were sick for more than two days were sent to the hospital at Seattle. At first there was considerable opposition and ridicule among the men and construction crews against the "health system," but the environment was so much better than the average railroad camp, that the men soon saw the value of the camps in regard to their own physical comfort, and the standard of the men as well as the grade of the work done was materially raised. The superintendent and the engineers in charge of the work unanimously endorse the sanitary camps.

Where the roadbed is not a natural drainage basin, drainage works consisting of dykes, ditches and filter beds will be constructed to care for the surface drainage. These drainage works are "roughed in" and will be completed when the rails and track are put through this section. By agreement with Mr. Pierson, chief engineer of the Milwaukee, the track through the Cedar River basin will not be laid until all the other road is ready for operation. The work will then be turned over to the maintenance department as soon as it is finished, eliminating any unnecessary construction work on this section. All water from the tracks and the road bed will be led off into tanks and purified in filter beds before it is discharged into the river. Dirt dykes and ditches are constructed along the road bed, leading to storage tanks and filter beds, located at convenient places along the track. These artificial drainage basins will have sufficient area to hold all the water that may fall on the roadbed, counting 12 inches rainfall a maximum fall in 24 hours. Through the charcoal and sand filters the water will pass down to the river below, after being purified by filtration. All the water from the road bed must pass through these filters before reaching the river below. The bridges will be of special design, built of reinforced concrete, and watertight floors arranged with a run-off connection on one side leading to a receiving tank and then to the filters, located at a convenient point at the end of the concrete piers. When the trains are operating through this section, all train closets will be closed the same as in city limits.

The sanitary protective work as carried out in the sanitary camps accomplished all that was expected. The final construction of the tracks and the protective operation thereof will fully protect Seattle's water supply against pollution.

WATER SUPPLY OF SALT LAKE CITY.

THE last annual report of Louis C. Kelsey, the city engineer of Salt Lake City, Utah, contains brief descriptions of the various sources of the water supply of the city. Some abstracts of the descriptions have been made and are presented herewith, particularly of the gravity supplies.

On the banks of City Creek, a beautiful mountain stream, the pioneer settlers of Utah pitched their first permanent camp. Following the laying out of the city, the water of City Creek was diverted by means of the unique system of ditches, which for many years served to distribute the water for both irrigation and domestic uses, and which still serves the purposes of irrigation.

The water supply, however, was not appropriated by the corporation, but by the individual lot owners, who dug the diverting and distributing ditches and controlled and regulated the water supply independent of the municipality. Subsequently the city assumed control of these ditches and of the work of cleaning and repairing the same, as well as of the distribution of the water, while the lot owners remained in control, and attended to the cleaning and repairing of the diverting channels, one of which takes water from the right and one from the left bank of the stream.

Later a pipe system was installed, which was intended to serve the business district and at the same time provide added protection against fire. The pipes, however, extended beyond the business district and afforded accommodation for a limited number of citizens, who were not slow to avail themselves of the opportunity to provide their homes with modern plumbing conveniences.

Some opposition was made to the

I. LAKE BLANCHE—BIG COTTONWOOD CANYON.

turning of the water owned by individuals into the municipal pipe system, but the popular demand for additional accommodations soon resulted in a general waiver of the original rights, and absolute control of the water by the city and its ownership of the ditch system as well as the pipe system is now universally acknowledged. In order to protect the water supply from pollution the city purchased the greater portion of the watershed and has since prohibited the grazing of live stock and other practices likely to pollute the water. The city thus acquired the exclusive right to the use of the water and to the land contiguous to the sources of City Creek.

The water from Emigration Creek, like that of City Creek, was first appropriated and brought into the city by individuals, and was distributed through a similar ditch system for irrigation and domestic purposes. The water and the ditches subsequently passed to the ownership of the city, although no formal transfer was ever made, nor any compensation given therefor.

The city also acquired a considerable portion of the watershed lands of this stream, although it is not the exclusive owner of the water supply. The creek is small, and because of its pollution from the passage of large bands of sheep and cattle, that are driven back and forth through the canyon, the water of the main stream has been abandoned for city use and flows to the farmers of Pleasant View, who are joint owners with the city in all the water of the stream, and who use their share of the water for irrigation. The city uses only the water from a spring near the mouth of the canyon, and which, together with the flow from a tunnel driven by the city into the side of the canyon, is conveyed through an iron pipe into the general distribution system of the city.

A suit is now pending in the third district court, which grew out of a dispute between the farmers and the city regarding the apportionment of the water of this stream, and an early decision is anticipated, which, it is thought, will not alter the present apportionment.

The water of Parley's Creek was originally appropriated and diverted through various ditches for the irrigation of 2,479 acres of farming land adjoining the city on the south. There were also several water-power rights used in the operation of grist mills and paper, sugar and woolen factories.

As the city's supply of water from City and Emigration Creeks became inadequate, an additional supply was procured from Parley's Creek through exchange with the farmers of water from Utah Lake for water from Parley's Creek. The water so procured was diverted through a conduit made of cement concrete that extends from the mouth of Parley's Canyon to a connection with the distributing system of the city, but it was first necessary for the city to extinguish the then existing power rights before the water could be diverted. This it did through purchase, thus acquiring the right to use up to 82½ per cent of the entire stream. In order to protect the water from impurities, the city purchased portions of the watershed lands, including all the principal farmsteads throughout the canyon and the water rights belonging thereto. Except such as were needed for the use of patrolmen, all the farm houses were removed and the land has since been used with a view to insuring the purity and increasing the quantity of the supply.

To this end, also, grazing and trailing of live stock has been prohibited throughout the canyon so far as possible. The water has been applied to the canyon lands during the spring and early summer in quantities sufficient to produce saturation. The effect of this has been substantially the impounding of the freshet flow in the soil, which was subsequently leached out and restored to the stream as a means of augmenting the later season's supply.

A question has arisen between the farmers and the city regarding the quantity of water which the city has the right to recover at the head of its conduit, as the equivalent of that which was previously used to irrigate the canyon lands now owned by the city and the increase due to seepage from the lands saturated during the surplus season. A case is now pending in the third district court, which was brought to quiet title to the use of all of this water from Parley's Creek, and the decision of this case will also settle the question above referred to.

Since the exchange of water between the farmers and the city, Parley's Creek has been measured and apportioned by a board of commissioners appointed annually under the terms of the exchange contract, which has now been in force for a period of nineteen years.

II. BIG COTTONWOOD CONDUIT—DIVERTING DAM.

The State's prison is also a joint owner with the city in the waters of Parley's Creek, that institution having a right in the Kennedy ditch for irrigation and domestic purposes. In order to afford protection against fire at the prison, the State petitioned for, and was granted, the right to carry its portion of the water through a part of the city's conduit, for which it was to pay a fixed sum annually. A cast-iron main was laid from the city's conduit to the prison, and the institution has since derived its supply for culinary purposes through the said pipe and conduit. Instead, however, of diverting the water from its own share of the stream, it has ever since been supplied from the city's share. For this water the city demanded payment, but the State refused to pay more than the sum fixed for carriage only, and the city accordingly gave notice that the supply would be shut off. The State then applied for and obtained an order from the third district court, enjoining the city against its contemplated action to deprive the prison of a supply of water from the city's works. The matter is still pending, and will be heard and settled simultaneously with the case brought to quiet title to the water and of the entire stream.

Big Cottonwood Creek is the largest of the several mountain streams in Salt Lake County, and its waters are always cold and pure. When the supply from City Creek, Emigration Creek and Parley's Creek was no longer sufficient to meet the growing demands for water, the right to about one-half of the Big Cottonwood stream was acquired by the city through exchange with the farmers who had originally appropriated it for irrigation. The terms of this exchange agreement are similar to that for the exchange of Parley's Creek water.

The water from this stream is carried into the distribution system of the city through a conduit of reinforced cement concrete, but as was the case on Parley's Creek, the acquired water could not be diverted through the conduit until existing power rights on the stream were canceled. This was accomplished through the purchase of the single unquestioned right, and the water was diverted to the city.

Shortly afterward the Progress Power Company secured an order from the third district court, directing the city to desist in its diversion of the water through its conduit between the 1st of October and the 1st of April of each year and to restore it to the channel of Big Cottonwood Creek during said season. Pending a hearing of the case, a compromise was effected whereby the city retained the use of one-half of the water and restored the other half to Big Cottonwood Creek. Later the case was enlarged so that title to the use of all the water of the creek might be quieted, and to this end every water user on the stream was made a party to the action. This is without doubt the most important water suit that has ever been tried in the courts of this State. The city's costs in the case will be many thousand dollars, but it is confidently expected that no curtailment of the right acquired by the city will result, and it is believed that a final settlement of the various questions involved will be worth more to the city than it will cost.

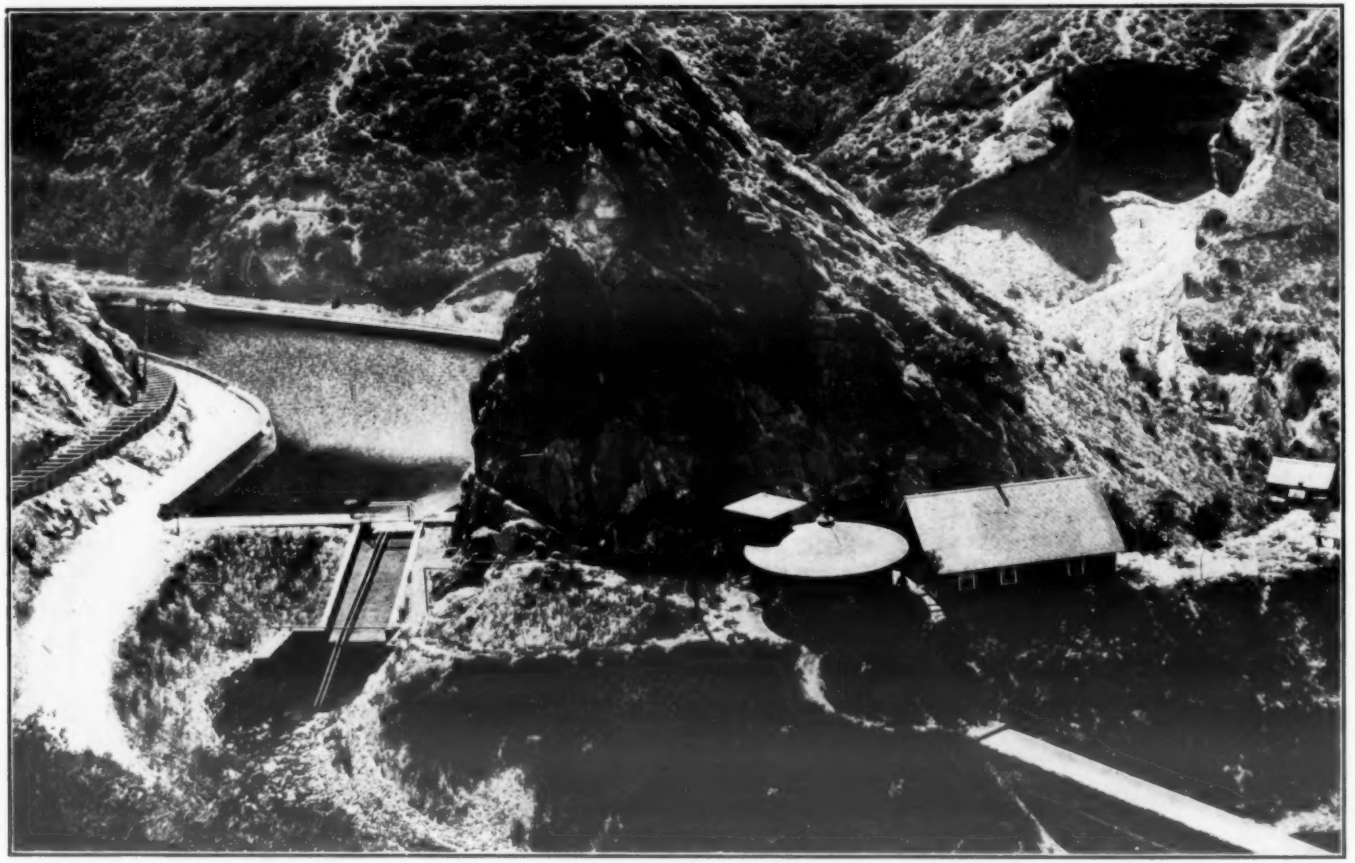
As in the case of Parley's Creek, the exchanged water is measured and apportioned by boards of commissioners appointed in pursuance of the terms of the several exchange contracts.

The mountain lakes have long been regarded as important factors in the water supply of Big Cottonwood Creek, but no really earnest effort has been made to utilize them as reservoirs for augmenting the supply of water for irrigation. This is due, no doubt, to the fact that for irrigation purposes large quantities must be stored at comparatively little cost, and the basins of these lakes do not afford opportunity for this.

As sources of supply entirely independent of any right in the stream, these lake basins possess little value as places for storing water for any purpose, and as has already been shown, they are not well suited as storage basins for irrigation purposes. Their real value, then, is for the storage of water for domestic uses in connection with rights in the natural flow of the stream for the same purpose.

Since the city has acquired the right of use to a considerable portion of the natural flow of Big Cottonwood Creek, the paramount value of these lake basins is in storing water for city uses in connection with this acquired right, and for this purpose their ownership by the city becomes a matter of no little importance.

Various filings have been made on these lake basins for reservoir purposes, but little work has been done



III. PARLEY'S CANYON RESERVOIR—OUTLET BIG COTTONWOOD CONDUIT.

in pursuance thereof, and all have been regarded as speculative rather than bona fide.

In order to extinguish all existing claims and remove all adverse rights to these lake basins, the city recently bought from Cole and Thomas all rights claimed by them under filings made to procure these lakes for reservoir purposes.

The most suitable of these basins for storage purposes are those in which are situated Lake Phoebe, Lake Mary, Lake Martha, Lake Catherine and the Twin Lakes. And for water to fill all of these the city has recently made application to the State engineer's office, in accordance with the law governing the appropriation of water.

To convert these lake basins into reservoirs for the storage of water for city uses it will be necessary to thoroughly clean them of all organic matter and to construct suitable impounding dams and outlet gates. When so converted they will be capable of holding considerable quantities of pure, sparkling water and will increase and make more dependable the city's water supply.

Two of the accompanying photographs, for which we are indebted to City Engineer L. C. Kelsey, show some of the natural and artificial reservoirs in the Big Cottonwood canyon which are now in use in connection with the city water supply. The third photograph shows the outlet of the conduit from the Big Cottonwood canyon into the Parley's Creek conduit, which continues into the city. It also shows the dam and a part of the Parley's canyon reservoir. The fourth photograph shows the same dam from the upper side before the reservoir was lined and filled with water. The fifth and sixth photographs show sites for storage and distributing reservoirs in Parley's canyon and City Creek canyon.

COST OF CONCRETE BRIDGES.*

By Henry H. Quimby, Engineer of Bridges, Bureau of Surveys, Philadelphia, Pa.

CONCRETE, either plain or reinforced, as a material of bridge construction possesses the merit of being adaptable as a substitute, within limits, for both stone masonry and steel framework, and of combining the qualities of both. It is equal to and may be more economical than stone masonry for abutments, piers, retaining walls, coping and parapets, and in many cases makes an arch available with its manifold advantages where a stone or brick arch would be impracticable.

It is found also to be an advantageous substitute in the shape of jack arches or reinforced slabs for steel floor troughs and buckled floor plates on steel bridges, whereby we have a composite structure, not strictly reinforced concrete, but a combination of steel members and concrete members. The resulting product, when the design and workmanship are good, is a rigid, enduring and economical bridge.

The limitation of the proper and economical employment of concrete in bridge structures can hardly be stated, certainly not with any degree of definiteness. Conservative designers are not in entire accord with respect to either methods of use or allowable working stresses, and comparisons of values and cost between all steel and part or all concrete or reinforced concrete can only be made on finished designs and for the same site. Even then estimators may not agree as to which will cost the more, and, if we may judge by the wide range of prices quoted in contractors' proposals, the contractors themselves cannot more accurately determine relative values in cost. To the purchaser the cost of a bridge is the contract price; the cost to the builder should, of course, be less.

The actual cost of a job to the builder is usually not published and is rarely divulged to even the engineer, and an engineer's basis of estimate must be the bids and contract prices previously obtained.

Any list of costs will exhibit great variation in the figures for structures of the same class and similar dimensions and conditions, and when the almost infinite variety of conditions

*A paper before the National Association of Cement Users.

IV. PARLEY'S CANYON DAM AND RESERVOIR—BEFORE LINING.

and combinations of varieties are considered, the difficulty of conveying useful intelligence on the subject is apparent.

The length of span, width, height, depth and character of foundations, length and shape of wings, loads to be carried, amount of filling or grading, railing or parapet, character and amount of paving, plain or decorative architecture, character of the concrete, plain or reinforced or rubble, market price of materials, and accessibility of the work to railroad service, all affect the question of cost.

It is therefore impracticable to select any unit of measure of a bridge and use it as a reliable basis for estimating cost. In a table covering eighteen concrete arch bridges recently built in Philadelphia the concrete price spread upon the span area, the clear span by the width, varies from $3.11 to $9.74 per square foot, and it varies from $1.73 to $7.39 per square foot of area occupied by the ground plan to ends of wings, the latter extremes being not on the same bridges as the other two. The average of the lot was $6.25 per square foot of span area and $3.50 per square foot over all, most of them being single-span bridges with long wings, and all being highway bridges designed to carry loads of 40 tons on two axles 20 feet apart. All have ornamental concrete balustrades and washed granolithic surfaces and paved decks, with electrical conduits and manholes, and water pipe and sewer well-holes, and some have pretty deep foundations.

If the whole contract price be set against the yardage of the concrete in the structure, the unit costs vary from $8.50 to $11.25 per cubic yard, averaging $9.75.

It is found that, in the circumstances under which the bridges referred to were built, steel plate girder bridges will cost more than concrete arches, the difference being considerable. Several opportunities for fair comparison have made this clear, as great a difference as 25 per cent of the higher being indicated. This saving is in the first cost, and if we add the capitalized cost of proper maintenance of the steel structure, which seems to be a fair element in the comparison, the advantage of the concrete arch appears far greater. A real money value also attaches to the superior beauty and attractiveness of a decorative arch structure in almost any locality, a question that almost always is the subject of consideration and decision in designing public work, for it must be determined what amount is proper to be expended for mere appearance.

The composite bridges, steel structural frame with concrete envelope, share with the arches, or at least promise to, the quality of permanence, and therefore exemption from expensive maintenance charges. As between the ordinary steel plate-girder bridge with buckled plate floor for permanent paving, and the composite type, the lower first cost is with the composite if the spans be short, for the greater dead weight of the concrete floor tells on the long main girders, whose section is usually determined by the general load, dead plus distributed live, while the individual floor members are determined by the heavy concentrated live load. The embedment of the floor stringers or joists in the concrete jack-arch construction effects a saving of steel, first by dispensing with floor plates, and second by permitting light stringers to be used, for the jack arches distribute a concentrated load over, say, three beams, where, with a buckled plate floor, each beam must carry the whole concentration, and besides, the embedment of a beam in concrete increases its carrying capacity about one-third.

Where it is the practice to protect steel bridges over railroad locomotive service by means of a wooden ceiling under the whole underside of the bridge, the economy of the concrete floor is more marked, because such a ceiling costs about 25 cents per square foot and lasts only a few years. This first cost alone will pay for about 1 cubic foot of concrete in the floor, and only about 15 to 18 inches average thickness of floor concrete is required. As steel floor plates with their riveting cost from 50 to 70 cents per square foot, the concrete floor appears to cost only about half as much as an all-steel floor, besides saving materially in the stringers. Floor beams may or may not be required to be heavier to carry the concrete floor. If they are not very long, the value of the concrete embedment may make up for the increased dead load stress. The main girders will need to be heavier than for the steel floor because little or no value can safely be assumed to be derived from the concrete casing.

The cost of concrete bridge work of almost all classes can be materially reduced and the service value of the concrete at the same time increased by the embedment in the concrete of a suitable hard stone in size from that

V. PROPOSED STORAGE RESERVOIR—PARLEY'S CANYON.

of spalls to the largest that can be conveniently handled or that will be comfortably accommodated in the compass of the forms. The economy of this construction depends upon the cost and shape of the embedded stone and the amount embedded without too much labor expended and without restricting the output of the concrete plant. It has been found that the percentage of the volume of the finished work that such stone amounts to varies from 25 to 40, or from 33 to 66 per cent of the volume of the mixed concrete, according to the shape of the stone and the care taken in placing it.

The cost of handling and placing this approximate third is probably about equal to that of mixing and placing an equal volume of concrete. The saving, therefore, should be the difference between the delivered cost of the concrete materials and that of the stone. If the stone delivered costs one-half as much as the cement and sand and gravel that, when mixed, equals it in volume, and if the embedded stone amounts to only one-third of the finished work, then the cost per cubic yard of the finished work is 80 per cent of that of plain concrete.

COST OF HIGHWAY IMPROVEMENT IN ALLEN COUNTY, IND.*

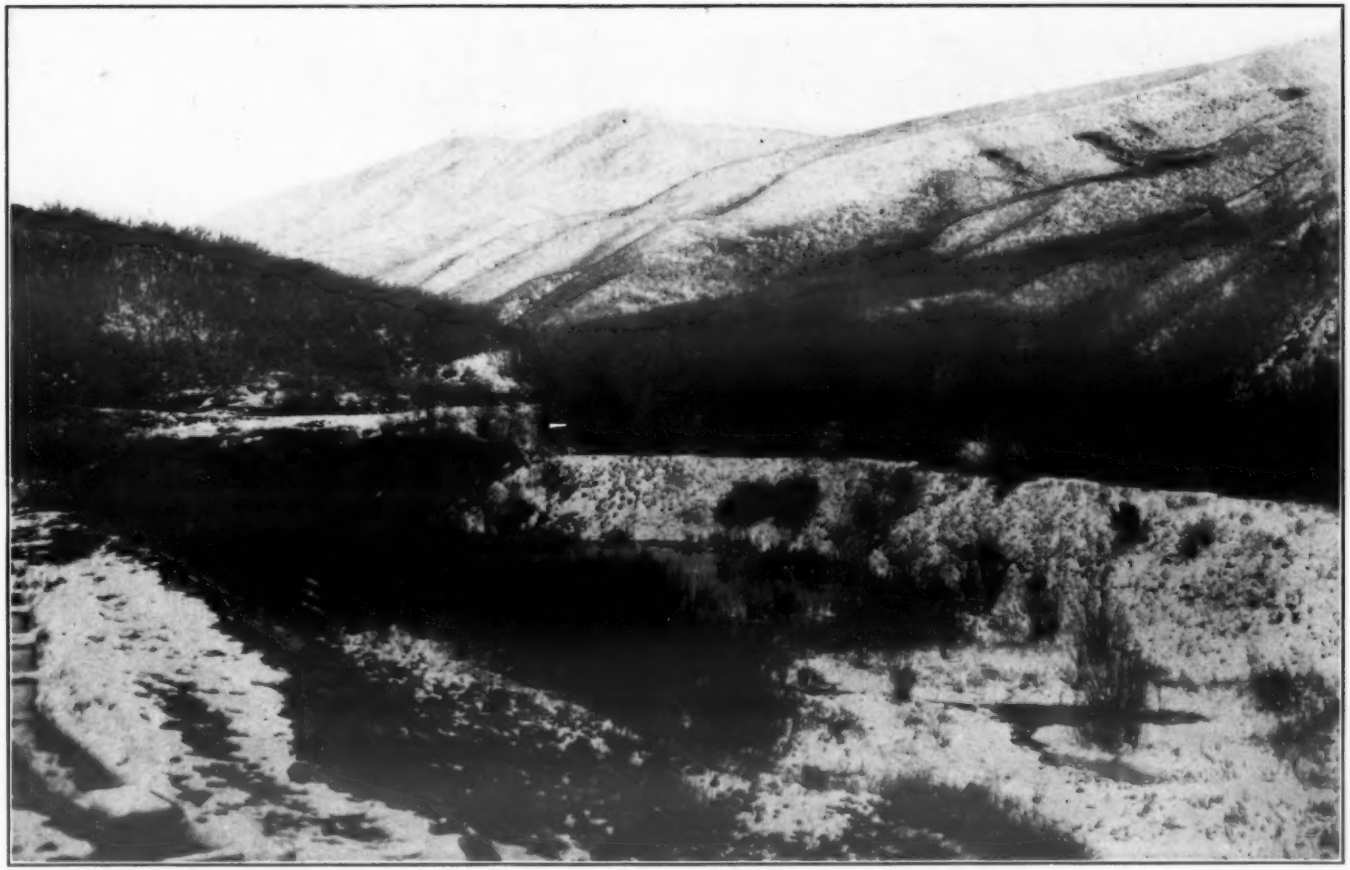
By G. E. Martin, Lafayette, Ind.

ALLEN County has been noted for many years for its good roads. Having three rivers within its boundaries, and also several beds of gravel, a good supply of gravel has been easily obtainable. With this material many miles of good gravel roads have been constructed. In the past few years, however, considerable macadam road has been built. The largest improvement of this kind has been in Maumee Township, which was finished last fall.

Maumee Township lies on the east side of the county next to the Ohio line. The soil is a kind of black muck, easily cut up, and hauling over the dirt roads in the wet season was almost impossible. The town of Woodburn on the Wabash Railroad lies almost in the centre of the township, and the roads were constructed in a system leading to Woodburn, which is the market town for the township. The recently improved road was constructed on the double track system, with the macadam portion on the right for teams going toward Woodburn. The highway was forty feet wide, with the grade 26 feet wide on the top, the macadam portion being 10 feet wide from the centre line of the grade, with a three-foot bank to hold the stone in place. The stone was placed 10 inches deep on the sides and 12 inches deep in the centre. One inch of screenings was placed on top of this, seven feet wide, as a top dressing. Crusher-run stone was specified to be used, but owing to its irregular composition, ruts were formed in the road. Two and a half inch stone was then used for the lower course with quarter inch screenings on top. The stone was furnished by the Erie Stone Company and came from the Huntington quarries. The length of the system of roads was 60,652 feet or 11.487 miles.

The contract for the entire improvement was let to the Erie Stone Company for $32,792.50 or a cost of $2,854.75 per mile or $1.62 per linear yard. The only grading to be done was to smooth the road off to receive the stone and furnish earth to hold it in place, except in one instance where a cut and fill of about four feet was made. The grading was estimated at fifty dollars per mile, and cost about that on the average. Stone cost $1.10 per cubic yard on the cars at Woodburn. The average cost of hauling it to the road was 20 cents per cubic yard or ten cents per cubic yard per mile. Two yards to a load were hauled, the farmers in the vicinity doing the work. Teamsters were required to help fill the wagons, though laborers were furnished at the cars to assist them. Spreading the stone on the road cost 14 cents per cubic yard. The road was drained by four-inch tile on each side of the road where tile was not already in. This cost about six cents per linear yard.

*A paper before the Indiana Engineering Society.



VI. PROPOSED DISTRIBUTING RESERVOIR—CITY CREEK CANYON.

A roller was not used on the work, action of the teams hauling over it being depended upon to pack the stone.

The township was bonded for $34,080.00 to furnish money for the improvement. These bonds were of forty equal series of $852.00 each, bearing date of July 15, 1907, the first payable May 15, 1908, and one each succeeding November 15 and May 15 until all were paid. The bonds bore interest at 4½ per cent. making the interest $19.17 every six months on each bond. The entire issue was sold at par. To meet the payment of these bonds a tax levy of 48 cents per hundred dollars was made in Maumee Township.

Resume of Cost Data.

Number of cubic yards of stone per mile	1,800
Cost per cubic yard of stone on cars	$1.10
Cost of haul per cubic yard per mile	0.10
Cost of spreading per cubic yard	0.14
Cost per cubic yard of stone in place	1.44
No. of square yards per mile of roadway	5,867
Cost of grading per square yard	0.09
Cost of finished roadway per square yard	0.48½

The town of Woodburn, a place of about 300 inhabitants, seized this opportunity to improve its streets. Two streets were improved with concrete curb and gutter and two with stone alone. The improvement in the town was under separate contract with the Erie Stone Company. The average cost of grading was fifteen cents per cubic yard. Stone cost $1.10 per cubic yard and hauling and spreading 40 cents per cubic yard. The actual cost for hauling and spreading was less than 25 cents per cubic yard.

Concrete curb and gutter was constructed with six-inch curb and 18-inch gutter, twelve inches deep, for 55 cents per linear foot. Headers of curbing alone were constructed for 35 cents per linear foot. Combined curb and gutter sewer inlets were placed for $7.50 each, and man hole covers for the catch basins at $4.50 each. The catch basins were built by the town. Cement sidewalk was constructed under the same contract for 12 cents per square foot.

FACTS AND FREAKS IN CONCRETE CONSTRUCTION.*

By W. W. Brigden, Superintendent of Waterworks, Battle Creek, Mich.

THE mighty impetus given to concrete work, both reinforced and plain, during the last five to ten years, has made it somewhat difficult for engineers not having unusual advantages to keep pace with the latest and best that is known in those lines. The writer thinks it a disgrace to the profession that so many engineers have failed to make themselves acquainted with what could easily be known by reading any of the best books on concrete lately published and gleaning from periodicals.

Is it right for an engineer to accept sand and gravel containing two to three parts, by measure, of sand to one of gravel when most authorities say these proportions should be reversed? A very good proportion for ordinary engineering works is one part Portland cement; three parts sand, which will pass through an ordinary brickmason's screen, ¼-inch mesh; four to six parts gravel, from ¼ inch to 2½ inches diameter. These proportions will do for more than nine-tenths of our engineering works. If we can believe the results of careful investigation by the best authorities, the relative proportions of sand and gravel should be nearer one of sand to three of gravel than one to two, which is the proportion largely used by those who have regulated this matter at all carefully.

The writer has screened many samples of sand and gravel, as they come from the pit, and has seldom found as much gravel as two to one, even on a 1-16th-inch mesh screen, and does not remember one case where it was as high as three to one; although there are places, no doubt, where that grade

*From a paper before the Michigan Engineering Society.

could be had. It is admitted that it is expensive and often difficult to separate sand and gravel so as to measure out the proportions of each accurately, but this is not necessary. Much more necessary is the gradation as to size. Frequent samples can be screened on small hand screens with 1-16, ⅛ and ¼-inch mesh; the work to be largely done by the inspector or foreman, and averages close enough for practical work obtained. It will not be long before the party making the inspection will be able to tell at a glance about what grade is being delivered and his objections and instructions to the teamsters doing the hauling shall generally cause them to load the proper material at the pit.

The sand and gravel for the Michigan Central tunnel at Detroit is obtained from the St. Clair river near Lake Huron, and it was found the proportion of sand and gravel and grading same often varied seriously from contract requirements. The proportion and grade were shown to the contractor's men, and it was found that at certain places the required material was readily obtainable.

The writer ventures the assertion that almost all the engineering and building work done in small cities and three-fourths in large places is done with sand and gravel just as it comes from the pit, with no proper endeavor to grade and to get enough gravel to obtain the best results from the mixture.

The author has seen building contractors in Battle Creek use three parts of sand to one of gravel many times, and has known contractors to insist on using the material nearest at hand, even when it contained excessive amounts of loams or clay in addition to an unduly large proportion of sand. If anything is said to a contractor on this subject he generally replies that he bid on the basis of sand and gravel as it comes from the pit, and he then proceeds to enumerate the various works he has done and to say they are there yet, he has tried them and they are as hard as the best stone, or harder. Sometimes they come to grief, but the trouble is never admitted to be in the proportions of sand and gravel.

We have tried four or five continuous mixers and found them better and much cheaper than the batch variety. Nearly all have some kind of adjustable feed that works automatically. One mixer had been employed on a business building in our city before it came to the concrete sewer we were constructing. A portion of this sewer was reinforced and, having almost no earth cover, was made of a nearly rectangular section, and a mixture of six parts aggregate to one of cement was used. We had reached deeper cutting, changed to circular form and, I believe, were using a seven to one mixture, when this machine was put in use. The change in color as the first concrete came from the machine indicated immediately that there was a great lack of cement. The men were told not to use any concrete until several sacks of cement were added to get somewhere near the proper proportions. On questioning the man sent with the machine he admitted the machine was set at twelve aggregate to one cement, and used that way at the store building. To make the matter worse, the material used for concrete was largely obtained from the cellar excavation and probably contained from one to three parts of sand to one of gravel.

Do not use wooden forms for concrete sewers. We have tried both and find the collapsible steel center cheaper and it makes a much smoother job inside. We moved the invert forms after 24 hours set and the arch forms after 48 hours. The same was true of wooden forms, even in cold weather.

A large food factory, about five stories high, was constructed largely of concrete, including floors and roof. The sand and gravel used on this building all came from the part the city where the building is located and runs say 1½ to 2 sand to 1 of gravel, not half enough gravel, if we are to believe Prof. Newberry, of the Sandusky Portland Cement Company, W. B. Fuller and other authorities. Some good authorities assert that one cement to eight sand and one gravel is only one-tenth as strong as concrete with one part cement, two and a half parts sand and six and a half parts gravel; the gravel and sand being carefully graded from a little over two inches average diameter down to particles not visible to the naked eye. In both cases an equal amount of cement and aggregate is used. In the first mixture, it is the writer's opinion, two parts of cement, instead of one, would be necessary to make admissible work to be used in ordinary everyday structures.

The writer has made a few experiments, among them some in which was used a 15-inch piece of 12-inch pipe, with plug leaded into the bottom. In this form were rammed various

amounts and grades of aggregate; the gravel carefully screened through several screens of different mesh. Cement was used, so as to conform as near to everyday practice as possible. It was found that the closer the uniform grading the smaller space the material filled, showing the voids were considerably reduced, the greatest difference being as much as 10 per cent. Such fine gradation is not practicable in actual construction; but an approximation, such as will be very valuable, is obtainable, even in contract work, by proper provisions in the specifications and intelligent, persistent inspection. We do our own work by day labor, which gives a control of the details of concrete aggregates not easily attainable with an old and experienced contractor. A large number of contracts have been drawn requiring all sand and gravel to be screened and measured, but the writer does not remember one piece of construction of any magnitude where it has been done, although there are cases, without doubt.

It is a disputed question whether Portland cement concrete receives injury from freezing during its initial set and for some hours thereafter. A concrete wall, say 2½ feet high and 2 feet thick, was constructed along a lake shore late in the fall. Its bottom was above the existing water mark and no part of it was hid in water. The proportions of cement and aggregate are not known, but, judging from appearances, it was not a rich mixture. That portion first constructed is in very fair condition, but the balance, which was done during hard freezing weather, has peeled off at the face so as to spoil its appearance at close view and in some cases the wall is inferior two inches inward from the face. The mixture was very wet or what is denominated "sloppy." Perhaps had the mixture been richer in cement or been put in dryer it might have passed through the cold weather without injury. Measures to protect the wall, by the use of lumber and timber, were used, but they were not very successful, although probably doing some good. The writer often uses lumber, tarred paper, etc., in freezing weather, placing lighted lanterns every twenty to forty feet, under the lumber and paper. These have proved invariably successful in sewer trenches and are not expensive. There is considerable heat in cement itself and this heat, with that of the lanterns, will keep the concrete from going below freezing until it is past danger. It may be that good concrete, unless too wet, will not suffer if unprotected, but until we are far more sure of this than now let us take the safe side.

Do not use rotten or soft stone in concrete if you can reasonably help it, especially in light construction. We once tested several 6-inch by 6-inch reinforced pieces with 4-foot span. There was a soft piece of sandstone in one, nearly 3 inches in diameter, 8 or 10 inches from the center of the span. The concrete broke right at that stone and with less strain than was given some other pieces.

Most engineers prefer mild steel for reinforcement, but some use the "high" grade because of its greater tensile strength. The writer once thought there was little difference between the two and, as mild steel could not be had in time, took some of that with high carbon. We tested this steel by bending ⅝-inch square and ½-inch round deformed rods back on themselves. Most of the rods stood this and some other tests well, but, having some of them left, they were used as anchors for a concrete seawall in water. The tests mentioned were made in warm weather, but freezing weather occurred shortly after building the wall. When the temperature was about freezing the ½-inch twisted rods could often be broken, where bent at a right angle at the factory, by striking a moderately sharp blow on a stone at the bend in the rod. Next time we shall buy mild steel, although we do not consider the test conclusive by any means. No trouble has occurred from the high steel yet, although some of it is not much over a foot from the surface of a brick pavement.

Many engineers think really useful tests are too difficult for them to undertake, in fact, entirely out of their reach; but this is not the case. It does not take a laboratory and expensive testing machines to learn many of the most important qualities of concrete and, while both forms of testing are very important, there are many cases where intelligence, study and hard work can determine the probable results of a problem in everyday engineering even better than can be done by the man in the laboratory. A man who says he does not need to study what others have said and done sadly lacks wisdom, but it would be a mere copyist who did not try to find out some things for himself, and his chances for success would be slim indeed.

SEWERAGE AND DRAINAGE OF CLINTON, IOWA.*

General Features of Design.

By C. P. Chase, City Engineer.

THE population of Clinton, Iowa, is 28,000; there are 65 miles of sewers in the system, of sizes ranging from 10 inches to 10 feet. The estimated cost of the system is $700,000. The city of Clinton is situated on the west bank of the Mississippi River, occupying a strip of land seven miles long fronting on the river and about one mile wide, the main or built-up portion of the corporation being an almost level tract of what was formerly termed "river bottoms," on which were situated, within the memory of many older inhabitants, many creeks, ponds, sloughs and bayous of the river.

All of this bottom land composing the greater part of the city has only a slight elevation above the level of high water of the Mississippi River. All along the western line of the corporation is a line of hills, through the valleys of which a large number of watercourses, draining several miles of adjacent territory, discharge a flood of water on the low ground in times of storms or spring thaws. The whole city is underlaid at a depth of a few feet with limestone rock, while in many cases this rock is in such a position as to form basins, with the higher points or rim of the basins along the bank of the river and much lower at some distance back from the river bank, thus forming pockets, which held the surface water and prevented its draining off through the soil naturally and kept the ground in a saturated condition the year round. The elevation of the low ground in the northeast corner of the city and the southwest corner of the corporation, seven miles apart, is the same, and as it would require at least 40 feet fall in a sewer to carry all drainage to one outlet, it became at once evident that it was out of the question, both from a physical and financial standpoint, and would involve an enormously expensive and unwarranted outlay in first cost and thousands of dollars annual expense, and would not even be mentioned by an engineer if it had not been advocated by some citizens through the press.

From examination of the city and the surveys made, it was determined that the division of the city into sewer districts, as near as possible according to the lay of the land, and each having an independent outlet, was the only feasible and economical solution. It was also found that the articles of consolidation of the old towns of Chancy, Lyons and Ringwood with Clinton, provided that in the new consolidated corporation their sewer taxes must be kept separate and no sewer tax levied on them to be expended in any other portion of the city, which, to some extent, had to be considered in drawing plans for construction.

Having the foregoing in view, it was deemed wise to divide the city into sewer districts as near as practical according to the lay of the land and the regulations governing before mentioned.

By such an arrangement immediate relief could be given many localities and hundreds of thousands of dollars saved over any more complex arrangement, and if it ever became expedient to unite any one or more outlets, they are so arranged that it would not disturb any previous construction and there would be no loss except in a small portion cut off from use, running out to the river bank, but the possibility of this was so remote, involving as it would a population of several hundred thousand, that it seemed unworthy of further consideration.

In view of the peculiar situation of the city of Clinton, it was deemed imperative to take care of the storm water in the low-lying districts, as it had become a nuisance and a menace to health and property. On the hills the drainage from yards and roofs was easily handled, as there is sufficient fall to carry the water in comparatively small sizes and shallow depths, and having the vast volume of the Mississippi to discharge into, there was no question of disposal involved.

Before beginning the actual work of the survey, a list of data necessary to be obtained was made and followed out in the order given.

1. Estimated future population of area, 150,000.
2. Gallons per capita of sewerage proper, 50.
3. Extra allowance for all subterranean waters, 20 per cent.
4. Establish a line of permanent benches through the whole length of

*From a paper before the Iowa Society of Engineers.

the corporation, about bisecting the area.

5. Prepare or obtain a map of the corporation.

6. Determine approximately what sewers you wish to run in alleys and what in streets.

7. Make a topographical survey of the whole corporation, taking levels at intersections of streets, half way between intersections, irregularities of surface and all leading points; this survey to be carried out to the dividing lines of the watershed.

8. Make a map of the watershed and drainage areas and sub-areas.

9. Obtain gauging of local rainfall and Government reports of Northwest.

10. Ascertain height of ground water and character of soil and excavation.

11. Average depth of cellars and elevations of cellar bottoms.

12. Location and character of rock by actual soundings.

13. Location of buildings and which way faced.

14. Locate and examine business districts and factories.

15. Determine location, size, grade and conditions of all existing sewers and drains.

16. Make notes of surface drainage and all natural or artificial watercourses.

17. Tabulate high and low water in the Mississippi River and obtain record of average stage of water as far back as possible.

18. Record of street grades already established.

19. Put all surveys on the map and contour the same.

20. Locate principal lines of mains and possible outlets and run special survey on these outlet lines to low water in river.

21. Examine river at proposed outlet points, depth of water, force, direction and probable effect of currents.

22. Complete the general design.

23. Cost of all materials that may be used.

24. Comparison of different materials of construction.

25. Current price and volume of local labor.

26. Make an estimate of cost of the proposed work.

27. Prepare such information as is needed for legal proceedings.

While the above is not new and the regular routine of the experienced sanitary engineer and such as we had followed in twenty-three systems previously designed, I do not know of any condensed list as above, and give it principally for the benefit of those seeking such information.

The program was carried out to the letter, and the results are shown in maps, plots and tables. So much detail was to be gathered that it was found impractical to place it all on one map, so a series was made as follows.

A. Shows the watershed and natural watercourses and surface drainage.

B. Natural elevations and established grades.

C. Size of drainage areas; acreage of each sub-area; percentage of imperviousness of the soil in each sub-area.

D. Contour map and shows location of main storm-water inlets.

E. Existing sewers, watercourses and drains.

F. Natural watercourses, present watercourses, proposed changes, and special information for commissioners' map required for change of watercourses.

G. Map of watercourses in District No. 4, on which a popular vote was taken as to changing and rebuilding.

H. New watercourses as changed in District No. 4.

I. General drainage and sewer system for the whole city of Clinton.

J. Plot of storms and rainfall and curve developed from same.

K. River records and computation tables.

L. Detail plans and change of watercourses and drainage in District No. 4.

M. Detail plans of branch sewers and drains in District No. 4.

In early days, all of the existing main lines of drainage in the old city of Clinton were open waterways. As the city grew and the streets were graded up and lots filled, these waterways were shifted and the old watercourses more nearly confined to a straight line. A little later some of these were walled in with stone and some with wooden boxes. Later on, when some of the smaller wooden boxes caved in, they were opened up, the top taken off and a pipe laid on the inside without any particular regard to size, grade, line, or making good joints. Practically nothing was done on these old waterways for the ten years from 1895 to 1905, and it was found that they were practically useless and in a dangerous and unsanitary condition. Another class of material that had been very unsatisfactory was asphaltum pipe put in many years before. This in most cases was

rotten and crumbled, thus caving in and stopping up.

Storm Sewers.—It was proposed to rebuild the old watercourses so as to be used as storm waterways and to build new storm sewers for the business part of the city and places where the difference in surface elevation was too small to carry the water on the surface, or where standing water was a nuisance by reason of the raising of the streets, filling the lots and building of houses so that the soil took up less each year, and the problem had to be met.

In brief, the main lines of drainage laid down on the plan are to be used as storm sewers or storm waterways, while the laterals will mostly be for use as separate sewers with an allowance for roof water, the surface water being carried to the main lines in the gutters and other channels.

No system of sewerage or drainage for the city of Clinton will ever be complete or first-class without being provided with arrangements for pumping, and this again is owing to the peculiar location. The great bulk of the city lies but 1 to 2 feet above high water in the Mississippi River. Low water in the river is recorded as 3½ feet above city datum, or an elevation of 3.5 feet. Extreme high water of 1880 is recorded as 23.8, a difference of 20.3 feet; the average grade of the streets on the level ground is 25, 26 and 27 feet, so that it is readily seen that these are but a foot or two above high water.

Of course water will always seek its own level, and a rain storm would disappear from the streets even if the river were at high water, but it would not be possible to use cellars, much less keep them dry, and derive full benefit from the system without pumping in high water, so that the ground could be kept well drained and cellars free from water, no matter what the stage of the river. Of course pumping would only be advantageous during the period of high water, and at all ordinary stages no benefit would be derived.

In order to ascertain, then, what was the average stage of water during the year, and at what elevation the mains would have to discharge, first to totally avoid pumping in some districts, and, second, to determine what would be the lowest elevation at which the mains could discharge free from backwater for the greater part of the year, the daily stage of water for the past eighteen years was obtained from the C. & N. W. Railway's record at the bridge, and also from the Government records since 1869. From comparisons and deductions from these records, it was found that it would not be necessary on an average to pump over two weeks of the year, in the lowest district, in order to keep dry cellars, and that the sewers could discharge at an elevation of 6 feet above low water without being materially affected.

Lower than this it would not be well to go, except, perhaps, for a short distance at the discharging point. It was also found that, starting at an elevation of 6 feet, all cellars at established grade in District No. 4 could be drained to a reasonable depth, and all mains in other districts could be higher than this.

The details of design and construction will be given in subsequent articles.

THE ENGINEER AND THE STATE.*

PRESIDENT'S ADDRESS.

By Alfred C. Lane, State Geologist, Lansing, Mich.

THERE are two pre-eminent aims of the engineer; the one is accuracy, the other efficiency. And the spirit and work of the scientist are in touch with both.

If the term "geological" has a scientific flavor, the word "survey" is an engineering term, and I have tried to conduct the geological survey with due regard to both interests.

The great questions that confront the State, the real questions of importance are engineering questions. I do not refer merely to the Panama Canal, nor those marvels of efficiency and engineering, our great warships, nor to the navies of the air which are just coming into existence. But the

*From a paper before the Michigan Engineering Society.

whole questions of the deep waterways, the development of the thirty-seven million horse power which may readily be obtained; the supply of unpolluted water to cities; disposal of their sewage; control of rivers, restraining their floods and fitting them for transportation; swamp drainage on the one hand, irrigation on the other; transportation by rail and by public highway; the control and correlation of all the industries that use, occupy and dig up the public streets; these and like questions directly affect the public health, wealth and happiness. They are the political questions of the future, and no one can say where they end.

Is there any reason why a State which already sees that we shall not get too much corn meal and water in our sausage, and that we get full weight of coal, should not also see that it is coal and not slate? There is no reason logically why every lot of coal that comes into town should not be tested and the British Thermal Units thereof, that is, the heating power and value therein determined.

I have said they are the coming political questions. They also are engineering questions, and the engineer asks, "How effectively will popular government deal with them?" and popular government is on trial.

Efficiency is in one sense economy; it is the greatest amount of work done for the energy expended, or money, which is but coined energy. But very often that means a large expenditure. The biggest engines are most often the most economical. There is a good deal of talk of economy which means merely curtailing expenditures regardless of whether the results are curtailed in the same or greater amount.

There are difficulties in expecting the public to know in detail about engineering problems, about the Gatun dam, or even to know what may fairly be expected of a private street railway, of a gas company, or of a public gas or electric plant. How far can a street railway company be expected to carry a man for five cents? There must be some limit of distance.

In regard to public servants in a popular government, there are two extreme views. The one view which logically leads one to distrust popular government, only grants to the people intelligence enough to select their rulers and believes that they should put themselves in their hands implicity. It was the original theory of the makers of the constitution that the people had not sense enough to select a president, but they might select electors who would have intelligence to choose more wisely. It has not worked out just that way.

The other extreme view would make the servants of the people instruments for registering the popular will, like presidential electors, mere dummies, as completely subservient to orders as the dummy directors of some of our great corporations.

This would be perfectly justifiable if the servants of the people know no more about the matter than the people themselves, because then they are no better able to judge the average good of the whole than that average itself. One who believes in the extreme application of initiative, referendum, and recall must also believe that the legislature and other similar bodies, are really no better qualified to decide such matters than the people themselves. It is an easy step farther to ask why not let the constituents do the voting themselves on all matters of import enough to make it worth the extra cost.

Yet it seems to me quite clear that in regard to great engineering propositions, whether the Panama Canal shall be a sea level or lock proposition; whether a Grand Rapids—Saginaw Canal will be feasible; whether the river floods which have grown more disastrous each year, can be controlled and whether forest reserves will help; popular government, either directly by initiative and referendum, or as now conducted by an average representative body of citizens, cannot be much more efficient than if each of us instructed a green cook how to get our dinners and we changed cooks every two sessions, I mean dinners.

We find more and more the habit growing up of putting important matters requiring special knowledge into the hands of expert commissions. The Massachusetts Railroad Commission is an illustration. Its composition is so guarded that there must be one thoroughly well posted practical railroad man on it, while other points of view are also represented. The Interstate Commerce Commission and the recent Commission on the State Tax Lands in this State, and various Highway Commissions will also occur to you.

This is true not only in politics, but in business. I not long ago had the pleasure of a trip with Vice-President J. F. Cole of the Steel Trust. There

was nothing he emphasized more to me or that made more impression on my mind than the importance and value of their system of committees to pass on all important questions, each member being a man picked to bring his knowledge to the common store, one to be a trained accountant, another to be an engineer trained in construction work, and so on.

So we find among our recent cities where the greatest failures in efficiency of popular government have been, that the very newest charters arrange for small boards of well paid men, like directors of a corporation, or at any rate, for Boards of Public Works to take care of the most obviously engineering features.

From an engineering point of view I know no more effective public work than that done by our United States Engineers, to whom have been given the colossal works of the Lake improvement. What are the steps, for instance, in a public improvement of that type?

First, an application for an improvement by parties to be benefited.

Second, an appropriation for investigation by the Engineers of the practicability and cost of the improvement, which may be supplemented by an estimate of the volume of use.

Third, an appropriation by Congress for the work.

Fourth, the execution under trained engineers.

This tendency to commission work is so obvious that I need not dwell on it longer. But there is a chance for more efficient government, and for the referendum, too, in the selection and the reception of the work of such commissions. Very often such commissions recommend changes in the present laws, or additions thereto. This has, for instance, been the case with the commission on State tax lands. They recommend certain legislation. Some of this seems to be very important. What will be its fate? If we may judge by the past too often such recommendations have simply been ignored.

I would, therefore, urge that laws asked by commissions empowered to recommend legislation, if not passed by the legislature in a form acceptable to them, should, unless vetoed by the governor, be submitted to popular referendum.

We have just had a commission, a large one because the work was large. We called it a constitutional convention. Members were paid about the standard rate of wages of surveyors. It was on the revision of the constitution of Michigan. On it were experts like Professor Fairlie, and Regent Barbour. They submitted their report, the revised constitution, with a pamphlet giving the reasons for the changes they suggest to a referendum of the people. The people have accepted it. The result seems to be generally satisfactory. Is there any real reason why the State Commission on Tax Lands should not similarly submit the results of their work to the people, not as amendments to the constitution, but as laws which the legislature could at any time amend? The pamphlet on the constitution was a valuable aid to the political education of the people and it seems quite possible that the people are intelligent enough to vote wisely on the reports of such committees, though, of course, they could not prepare them. It would seem that if on every such commission there were at least one lawyer of Supreme Court caliber and one fit representative of the great schools of the State, and care was taken to let the commission represent the different interests affected, better considered legislation would be obtained than a State legislature, under existing conditions can, with the best intentions in the world, prepare. Members of such commissions might well, in some cases, come from outside the State.

Before leaving this matter of the relation of commissions and referendums I would give one more illustration. The town of Brookline, Massachusetts, with over 20,000 people, a city in all but name, is said to be an illustration of the old fashioned New England town meeting. It is really a government by a commission, the selectmen, with a town meeting referendum. The town meeting is carefully cut and dried and all the necessary votes of money and the reasons for them printed, and a very intelligent and orderly constituency makes this form of government work very well.

Now, in all this adaptation of the popular government to make it more efficient, what have we to do, as units or as a society?

As individuals we may have a threefold part:

First, as citizens and voters we may help to raise the intelligence of the public in such matters, so that it will insist upon high grade fit men on the commissions.

Second, those of us who are working as servants of the State, directly or

indirectly, as so many of us are, can do all in our power to see that the work of which we have charge is effectively done, and sets a standard of good work.

Third, as members of this and similar societies we may help to strengthen it and make it and them better represent the engineering profession and make its voice and spirit have more influence, both in insisting upon trained commissioners, and in insisting upon a careful and respectful attention to their findings, and a chance for the people to ratify them.

Let me illustrate these three points.

A certain town had bids for bridges; the one, for all steel; the other, cheaper, for reinforced concrete. The council hesitated which bid to accept, was not sure the cheaper would be durable, talked of an expensive trip to Cleveland and elsewhere to see bridges of various kinds. A member of this society went to his alderman and told him of certain reinforced concrete bridges railroads had put in near by. That evening the bid for the reinforced concrete was accepted.

The third point is an important one. The Lake Superior Mining Institute is debarred by its constitution from undertaking anything political. Local engineering societies have not the breadth. We need very much to have a society so large and so strong that almost every reputable surveyor and engineer within the State will belong, so that in engineering matters and for engineering ideals it can speak with a voice of authority.

As a society we have a great work. We have to promote intelligence, accuracy and fairness in considering these engineering problems.

But I would especially emphasize the fact that this society has a great work to do in making popular government effective through those commissions upon which I have laid so much stress, both as individuals and collectively.

In the first place, we should as individuals and together emphasize the importance of accurate determination of fact and the wisdom of having the maturely prepared reports of such commissions considered and either directly accepted by the legislature or put to a popular vote. We have no committee that has done for state legislation what our standing committee has done for municipal work. There is a field for some patriotic engineer, as a working chairman.

I close, then, with some practical suggestions:

That such a committee take up the work.

That as individuals and collectively we work to see that the legislation recommended by the commission on State Tax Lands be accepted or submitted to the voters.

That on our various commissions, and in particular, in the work of the Highway Commission, a standard of efficiency be kept up not less than that which was set by our former president F. F. Rogers, and that in all such places, and in the positions of county surveyors, the highest practicable qualifications be obtained.

CITY HALL, LITTLE ROCK, ARK.

EDITORIAL COMMENT

Cost of Asphalt Pavements Laid With Municipal Plants

Public Discussion of Municipal Affairs.

Cost of Concrete Bridges.

COST OF ASPHALT PAVEMENTS LAID WITH MUNICIPAL PLANTS.

The reports on the cost of operating municipal asphalt repair plants in Columbus, O., published in MUNICIPAL ENGINEERING, vol. xxxvi, p. 42, and in Indianapolis, Ind., vol. xxxvi, p. 115, give the results of this class of work with permanent plants. The report from Marion, Ind., in this number, gives the results from a small portable plant operating only sixty days a year. The article on the Detroit municipal asphalt plant, elsewhere in this number, gives the data for a large plant for a number of years' work in repairing and relaying pavements and laying new pavements.

The reports are not made on the same basis, exactly, and data enough are not given to reduce them to the same basis, but some comparisons are possible, always with the reservation of lack of conformity of data.

As to cost of materials the following table gives some data:

In Columbus the salary of the superintendent was charged to the plant for the four months of operation, amount not stated.

In Indianapolis the department operates a small force at every convenient time during the year. Whether the superintendent's salary is included in the cost of operation is not stated.

In Detroit the superintendent's salary for the year is apparently charged to the operation of the plant, deducting time spent on other work during three years of the five covered by the report.

In Marion nothing is charged for superintendence, as the city engineer and his assistant look after the work without any expense to the city beyond the salaries already paid them.

The greatest difficulty in making comparisons arises in the consideration of the amount of materials used per square yard of pavement laid. The principal reason for this is the variation in depth of compacted asphalt as laid. It seems to be customary to consider the average

1. COST OF MATERIALS IN ASPHALT PAVING.

City.	Asphalt per Ton.	Sand per Cubic Yd.	Limestone Dust per Ton.	Flux per Ton.	Cement per Barrel.	Fuel per Ton.
Columbus, O.....	$24.00	$1.20	$2.80	$25.50	$1.20	$1.55
Indianapolis, Ind...	20.00 & 23.00	0.90	3.00	.05*	.....	.....
Detroit, Mich.....	25.80 & 27.60	0.72	3.15	10.50 & 25.80	1.05	2.70 & 6.15†
Marion, Ind.....	30.00	0.75	**	***	1.40	5.50†

*Per gallon. †Per cord. **Used Portland cement. ***Asphalt delivered fluxed ready for use.

Prices in Detroit are for the year 1908. They varied considerably during the five years of the report.

As to the cost of labor, the following data are given:

2. COST OF LABOR IN ASPHALT PAVING.

City.	Expert Labor per Hour, Cents.	Common Labor per Hour, Cents.	Teams per Hour, Cents.	Firemen and Engineers per Hour, Cents.
Columbus	..	22.22	40	....
Indianapolis	31.25	20	43.75	43.75 to 50
Detroit	31.25 to 37.5	21.87	50	43.75 to 50
Marion	25	20	27.5	....

depth as 2 inches, but Columbus reports some asphaltic concrete 3 inches thick; Indianapolis reports an average thickness of pavements not under guaranty of 1.5 inches, while the resurfacing done consisted of 1 inch of binder and 2 inches of top; Detroit reports repaving and resurfacing to require 1.5 inches of binder and 2 inches of top, while patches averaged 3 inches in thickness, mostly top mixture; and Marion reports 2 inches average depth of patches. Another source of discrepancies is found in the irregular forms of the patches, which result in irregularities in measurements, which may be exaggerated by a desire to make as good a showing as possible of area covered and low cost.

The following comparisons of cost must therefore be taken with considerable reservation:

charged for the whole year on the investment for the year, and is not limited to the period of full operation. Marion's charges are at the rate of 10 per cent. a year for depreciation and 6 per cent. a year for interest, the total for the year being distributed over the sixty days the plant was in operation. The table shows the work of twenty-five days and carries twenty-five sixtieths of the depreciation and interest for the year. There is considerable difference between zero at Columbus and 16 per cent. a year at Marion, and the figure (8.03) is therefore added for Columbus, being 10 per cent. of the cost of the plant, assumed at $15,000, distributed over the 18,689 square yards laid.

Detroit charges 20 cents a square yard maintenance on resurfacing and such repairing as was done for the city, but charges no maintenance on

3. DETAILS OF COST OF ASPHALT PAVING PER SQUARE YARD.

City.	Labor and Materials, Cents.	Miscellaneous Charges, Cents.	Interest and Depreciation.	Maintenance.
Columbus	73.69	5.06	(8.03)	....
Indianapolis	66.48		1.22	....
Detroit	84.77	3.20	3.20	20.00
Marion	82.40	0.00	3.00	....

4. COST OF ASPHALT PAVING PER SQUARE YARD.

City.	Square Yards Laid.	Cost Reported pr. Sq. Yd. Cents.	Total Cost pr. Sq. Yd. Reduced to Same Basis, Cents.
Columbus	18,689	78.75	86.78
Indianapolis:			
Relaying	9,540	113.20	113.20
Private work	7,540	163.50	163.50
City patching	75,428	52.40	52.40
Total	92,472	67.70	67.70
Detroit:			
Repaving	104,089	105.18	88.66
Resurfacing	329,637	114.43	94.43
Patching	138,372	91.17	91.17
Marion	1,308	85.40	85.40

In Table 3 the charges are reduced as nearly as possible to the same basis. Indianapolis bases its charge for interest and depreciation at the rate of 5 per cent. per annum on the total investment for each for the 6.5 months the plant was in full operation. Detroit's charge is 10 per cent. for depreciation, with no charge for interest, and is therefore equivalent to the Indianapolis rate, except that it is

repairing done for private parties who assumed their own maintenance charges, nor on patching. This charge is proper in comparing cost of work with prices made by contractors bidding under specifications requiring guaranties for periods of years, but is not so for purposes of the comparisons made in these tables. It is therefore deducted in Table 4 in the column of "Total cost per square yard," which

is reduced as near the same basis as the figures furnished in the reports will permit.

When thus reduced to approximately the same basis, the figures become very nearly the same, almost exactly the same when the average of 67.70 for Indianapolis is taken and increased about 33 per cent. to reduce the average thickness of patches of 1.5 inches in that city to the 2 inches reported from other cities; and the Detroit figures are reduced proportionately to the excess in thickness of patches there. Detroit and Indianapolis both credit their street patching accounts with the profits made on work for private parties. This reduces the cost of work in Detroit 10 cents a square yard and in Indianapolis even more. This is correct from the point of view of the operators of the plants, because they have earned these profits and thereby relieved their appropriations of that amount of strain, but the actual cost of operating the plant for public purposes alone is the larger figure before the credit for such profits is taken. There is nothing to show that Columbus takes such profits except the statement published in MUNICIPAL ENGINEERING, some months since, that that plant charged private parties $1.25 a square yard. The report published in the January number shows no such work, and may not include it. Marion did no work for private parties.

PUBLIC DISCUSSION OF MUNICIPAL AFFAIRS.

The fact that many cities have unearthed scandals in their municipal departments is undoubtedly the basis for the fashion of slandering municipal officials which has grown up. Unfortunately there are too many cases in which the statements made are not slander, although the evidence upon which they are based is not sufficient to make criminal prosecutions successful; but there are many cases in which damages for slander could be obtained upon proper showing to the courts. The average officeseeker and officeholder has become accustomed to this kind of attack and accepts it as one of the appurtenances of his office. He pursues the even tenor of his way and makes no effort, by throwing open his records to the public or by demanding investigation of the charges floating round, to substitute knowledge for ignorance and thus reduce the number of slanderers to those of no influence who cannot from temperament or capacity recognize or at least acknowledge the truth when it is fully set before them.

A few cities have bureaus of statistics which are supposed to publish the facts about the city, but none of these publish the facts about the city offices, beyond the totals and the results, which are of no particular value in judging the methods by which these results have been obtained. The city of San Francisco has begun the publication of a weekly bulletin upon another principle, that of reporting the daily operations of the city departments. It is largely devoted to the report of methods of operation and of details of results, and promises, as the needs of the case are seen, to be a most salutory check upon city officials and employes. It is, however, an official publication and, when the civic conscience has again dropped into slumber, may perhaps be manipulated to give misinformation. Thus far no such suspicion has foundation and the *Municipal Record* is a valuable guide to the activities of the city's officials.

The city of Memphis, Tenn., has taken another step and a private company publishes a weekly paper, called *Civic Affairs*, which discusses civic questions from the unofficial standpoint, and at the same time presents semi-official statements upon various city departments. An example is an analysis of city disbursements, made by C. C. Pashby, assistant city engineer, which presents the facts about the taxes and their purposes, and the city's expenditures, in striking form, readily understood even by the casual reader, and puts them in comparison with similar data from other cities. For example, he says with reference to one tax, the amount of which he has computed upon the assessed valuation of $2,000 for a piece of real es-

tate, which he says would be a modern cottage on a 50-foot lot, owned and occupied by a citizen with an income of $1,500 to $1,800 a year:

The writer wishes to further subdivide the $5.72 contributed to streets, bridges and sewers. Under the system of street improvements out of the general tax funds this item in the tax bill was the cause of more complaint than any several others. Scores of citizens have filed complaints of the failure of the city to give value received in street improvements for taxes paid. As a matter of fact, very little of the money contributed in the payment of general taxes can go into new street improvements.

In the year 1906 our citizen whose property is assessed at $2,000 contributed but $1.68 toward new street construction, 70 cents to sewer construction, 25 cents to construction of bridges, 22 cents to construction of subways and new buildings, 79 cents to repairs of streets, $1.27 to the cleaning of streets, 7 cents to the maintenance of sewers, 29 cents to the up-keep of Court Square, Market Square, Winchester Park, the repairs on public buildings, and maintenance of the city chain gang, and, finally, 43 cents to administration expense of the engineering department, including the office, engineers' wagons, inspectors, watchmen, guards, stakes, etc.

By way of parenthesis, it may be said that a first-class pavement laid in front of our citizen's lot will cost approximately $10 per lineal foot of street, or $500 for the portion in front of his lot. To build this out of the general tax fund will require the period of years represented by 250 divided by 1.68, or 148 years.

Unofficial publication of official information sometimes carries more weight than publication which might be biassed, although the danger of "inspiration" is not greater in the one case than in the other. It often takes different form. The main point, however, is the supply of full and accurate information. Much of our complaint of municipal mismanagement will lose its force if the facts are known. Nearly all of our accusations of graft will lose their force if there is either official or unofficial publication of the facts, partly because the dangers of publication will stop the grafting, but far more largely because the facts will show the baselessness of the charges.

There is more than enough incompetence and rascality in office, but there is not nearly as much as is suspected. Other cities will do well to follow either San Francisco or Memphis. Some have, but their number is small. Some cities already have the necessary mediums for such publications, notably the *Worcester Magazine*, *Commercial Club Monthly* and the like, and only require the necessary co-operation or investigation of the municipal officials, whichever may be necessary under the local conditions.

COST OF CONCRETE BRIDGES.

In the paper on the subject of the cost of concrete bridges, by H. H. Quimby, printed elsewhere in this number of MUNICIPAL ENGINEERING, it is shown that if all the component parts of concrete bridges are taken into account, there is no common unit of measurement of the cost such that there will be any uniformity in cost per unit. In Mr. Quimby's list are included "span, width, height, depth and character of foundations, length and shape of wings, loads to be carried, amount of filling or grading, railing or parapet, character and amount of paving, plain or decorative architecture, character of concrete, whether plain or reinforced or rubble, market price of materials and accessibility of the work to railroad service."

It is evident that there are here too many variables for one to expect uniformity in the cost per cubic yard of concrete, per square foot of area of bridge, per square foot of area over all, per foot of span. The least variation in the three methods of comparison Mr. Quimby uses is in the cost per cubic yard of concrete, which varies from $8.50 to $11.25 per cubic yard and averages $9.75 for the 18 bridges included in his comparison.

These bridges had reasonable uniformity in number of spans, in wings, in loads to be carried, in parapets, paving, architecture, character of concrete, market price of materials. The principal variables seem to have been length of span, width, height, depth of

foundation, amount of filling or grading, and accessibility of the work to railroad service. All of these but foundation, height and accessibility vary to a considerable extent with the variation in length of span and width of bridge, and if the three former are allowed for, some relation between those remaining might be found. If the comparison is to be made between materials, the foundation and height should be omitted, because they are very nearly the same for all classes of materials, and, if they are omitted, such comparison will be on a fairer basis, as well as giving a more uniform cost per unit of measurement of the concrete bridge.

The fact seems to be that all the items in the long list of variables except possibly depth and character of foundations, length and shape of wings, character and amount of paving, and plain or decorative architecture, can be considered as varying in combination quite uniformly, notwithstanding the fact that individually they may vary according to no definite rule, and if the foundations, wings, paving and architecture are considered separately, a reasonably regular price per unit, say per cubic yard of concrete, will be found. This statement is made, at any rate, in this general form by estimating engineers who bid regularly upon contracts for themselves and their employers. Wages may also be included in the list of variables and not affect the general applicability of this statement. Foundations and wings can be estimated separately according to quite well established methods, and paving can also be easily estimated for given conditions of base and wearing surface, so that if data on the average cost per unit for the proposed combination of variables are compiled, such average cost for the bridge can be taken as a basis and additions made for foundation, wings and paving, with reasonable expectation of uniformity. The cost of decorative work is more difficult to estimate, so that when the plain but good construction provided for in the estimates, prepared as described, is decorated, individual experience must be depended upon largely for estimates of the increase in cost due to such decoration.

Mr. Quimby's figures would have been much more valuable if he had recognized the difference between the list of general variables and the special variables which are too closely dependent on local conditions to be included in that list, and had made his comparison on the basis of the general list. MUNICIPAL ENGINEERING will make a collection of data for the purpose of procuring, if possible, some reasonably accurate unit of comparison, and will be grateful for contributions to the collection from its readers, if they will send such data as they have, giving information about all the items in Mr. Quimby's list and adding the items of wages and effect of methods of payment for bridge work in vogue.

THE QUESTION DEPARTMENT

Sewage Purification by Sedimentation.

In an urban municipality (population about 5,000)) the Municipal Council are contemplating the discharge of the sewage in a ravine about two miles from the town and at a point about one-half mile from any public highway or dwelling-house, and about three thousand feet from a marsh leading to Lake Ontario.

At the present time they wish to avoid for a few years the expense of constructing a system of septic tanks, but would be glad to provide a means of partial purification at a moderate cost.

The ravine into which the sewage will be discharged (being carried to this point by means of a 20-inch sewer tile) affords an opportunity to provide at a small cost,

a sedimentation basin sufficient to retain the flow of sewage for from five to seven days or longer if required.

Of course the basin would be in the open, and exposed to the atmosphere and have an average depth of about two feet. The inlet to the basin would be at the upper end (from one side) and the discharge could be carried through the retaining wall by means of an angle pipe with inlet to same about one foot below the surface of the standing fluid, thus preventing the discharge of floating matter. Two or three of these could be supplied at different points and be used at alternate periods to divert the line of flow.

Now in view of the claims made by the "Hampton doctrine in relation to sewage purification," that physical action constitutes the fundamental principal of tank operation, and that in septic tanks, the operation is largely due to the influence of the retained sludge; and having thus briefly set forth the conditions as above stated, I desire to know your opinion of the usefulness of this simple sedimentation basin, and, if you think its construction worth while, how often should the basin be emptied and the sedimentation removed?

B. S. W., ———, Ontario.

The principal objection to the program outlined above is the shallow depth of the sedimentation basin. Such a basin would soon be put in bad condition by the accumulation of sediment, not only the decomposing animal matter but the inorganic matters, rags, and other refuse, and then only part of it would be of much use. So large an area would also be difficult to clean.

If the sedimentation basin were some 6 or 7 feet deep the area would need to be only one-third as great, or less. Again, good results are obtained by retaining the sewage in the tank much less than 6 or 7 days. English practice varies between 12 and 24 hours, and American practice between 8 and 16 hours. This again would reduce the area of tanks to one-sixth that sugested in the question, or even less. This brings the sedimentation basin down to a small tank which can be built below the ground level and left open if desired, and will cost very little. There should be a small detritus chamber with a screen in which the heavy inorganic matters and floating non-decomposable solids can be caught, and then the sediment in the settling tank itself will give little trouble.

In the northern country of our correspondent the winter temperature would have a serious effect upon the shallow basin and some effect, though less, upon the deeper tank. There would also be much greater probability of nuisance in summer from the shallow basin, necessitating frequent cleaning and difficulty in disposing of the sludge. With the deeper tank the sludge will take care of itself to a considerable extent, provided the screen and detritus chamber are used and cleaned frequently. At infrequent intervals, perhaps once or twice a year, if the tank is properly designed, the sludge may be pumped or dredged out of the tank without much disturbance of the surface, and it will be so thoroughly decomposed that it can be spread on the ground without danger of great nuisance. What little danger there may be can be obviated by mixing the sludge with lime as it is deposited on the ground.

A temporary wooden roof with trap doors for access to the tank would be inexpensive and would be advisable in the northern climate.

The writer has had success in designing the full purification plant that would ultimately be necessary and then building the tanks one at a time as the demands for greater purity of effluent and necessity for economies in operation increase, and would suggest the same procedure here.

Allowable Head on Reinforced Concrete Pipe.

A pipe line through which water is to be conducted is under contemplation. Same is to nine miles long with twenty-two inch diameter. Along this proposed line we have several hollows to cross, some with a drop of fifty feet. I would like to receive your advice regarding reinforced concrete, and if same will stand a fifty foot head. Any other advice concerning the construction of said line will be greatly appreciated.

G. D., Evanston, Wyo.

The question of reinforced concrete conduits under pressure has been discussed briefly several times in MUNICIPAL ENGINEERING. For example in vol. xxxii, p. 317, where there are also references to other articles on the subject. Still other articles will be found in vol. xxxii, p. 164, 343, and 394, the latter noting pipes on the Salt River power canal in Nevada of 5 feet 3 inches diameter, part of which are under 85 feet head, and a half-mile under 30 feet head. In vol. xxxv, p. 255, is a note about a 50-inch reinforced concrete pipe on U. S. Reclamation work in Idaho, which is under 64 feet head at its lowest point. The U. S. Reclamation service offices would probably supply specifications for the pipe to be constructed on that work, upon request.

Book on Reinforced Concrete Floors.

Can you inform me where I can get a work on re-inforced concrete work, particularly re-inforced floors? I wish a book that would be an authority on same.

W. E. B., Bessemer, Ala.

Buel and Hill's "Reinforced Concrete" ($5) probably contains the most information of the character desired. Taylor and Thompson's "Concrete, Plain and Reinforced," ($5) also contains some good examples and Kidder's "Architects' and Builders' Pocket Book" ($5) contains similar information, the last edition, recently issued having been re-written so far as this section of the book is concerned. They are all good authorities. The various manufacturers of reinforcing issue booklets containing much valuable information, which is reliable, at least so far as the standard prominent firms are concerned.

Ordinances Governing Sidewalk Construction.

We contemplate drafting an ordinance whereby this city will be empowered to do our sidewalk paving and curbing by contract, and not left to each individual to select his own material. Our aim being to secure uniformity in appearance, quality, and to properly supervise the construction, which cannot be done under our present law. Do you know of any cities, having populations between 50,000 and 100,000 who do their own work of this kind, by contract or any ordinances regulating work of this character, published in text books?

H. F. H., ———, N. J.

In the State of Indiana, sidewalks are treated exactly like other street improvements and they are constructed under contracts let by the Board of Public Works or the City Council acting as such board, according to the class in which the city belongs. No property owner can construct his own sidewalk except by special permission of the board under such regulations as it may choose to impose.

Probably in most states the same mode of procedure can be instituted by the City Council, although there are many in which the general custom seems to be to permit the property owner to construct his own sidewalk, and in case he neglects this duty, to construct it through the proper department, by contract or otherwise, making assessment of the cost against the property benefited. The laws of the State of Nebraska, for example, prescribe the mode of procedure. Where the statutes do not govern the matter the City Council can doubtless do so by ordinance. Whether it can do so or not is a question for the city attorney or other attorney familiar with the statutes and court decisions of the state in which the city is located.

In the January number of MUNICIPAL ENGINEERING, vol. XXXVI, p. 30, will be found two outlines of forms of ordinances which were in operation for many years. The first is the form used in Indiana, which is in the form of a declaratory resolution passed by the Board of Public Works or by the City Council in the smaller cities, which can readily be reduced to the standard ordinance form. It provides for the construction of walks by the city under contract, and can be made to cover a continuous new walk or the insertion of new strips in a sidewalk, part of which has already been constructed in a satisfactory manner. The second form given provides for the construction of walks by the property owners and ultimate construction by the city if the property owner fails.

Cities in Ohio also construct their sidewalks under city contract.

Will our readers send in forms of ordinance in use in their cities governing sidewalk improvements?

How to Set Tile Floor.

As I have had some trouble getting floor and grate hearth floor tile set too tight, would like you to please refer me to some company who gives rules for same. If you can get me name of some firm who has hand book for tile setters will be very pleased, as have had sometrouble in west Texas dry climate.

R. L. F., Clinton, Ind.

Very full instructions for laying tile floors will be found in MUNICIPAL ENGINEERING, vol. XXIV, p. 186. There is also a general article on tile floors in vol. XXXIII, p. 5. Following are instructions taken from a little book issued by a dealer in building materials:

For Laying Foundations.—A solid foundation on which to lay tiles is one of the first considerations and of the utmost importance in order to insure a permanent flooring. This foundation may be concrete laid three inches thick, and made of one part Portland cement and three parts clean, sharp sand, or four parts of broken stone or gravel. In all cases float off the above with a thin coat of cement to a level, allowing one inch from the top of the floor surface for tiles and cement. Care must be taken that the floor, on which the concrete foundation and tiles are intended to be laid, is sufficiently strong for the weight; if not, the floor should be strengthened by additional beams or shored up from underneath as may be deemed necessary by the architect. Where the strength of the joists will permit it the tops should be beveled, which will give additional strength to the floor, then allow the concrete foundation to be at least half an inch above said joists or beams.

To Replace Wood Floors With Tiles.—Cut the old flooring taken up, into lengths to be laid on cleats between the joists or beams (these boards should not be wider that 6 inches), and firmly nailed at the corners to the cleats, leaving a small space between the edges of each board to allow for swelling.

On this sub-floor fill in the foundation with concrete as already described, to 1-2 inch above the top of the joists, or within one inch of the top of the finished floor. Let the foundation properly set before laying the tile. Under no circumstances lay tiles on wood without a solid foundation, as they would only become loose in a few weeks.

Laying Floor Tiles.—Floors having a border can be laid more readily and more regular by laying the border first. Nail on the foundation strips of wood or guides of the exact thickness of the tile and cement used in bedding the tiles. Then spread the cement of the right thickness (1-2 inch) on which the tiles are to be imbedded, and level off with a straight edge. This top coat in which the tiles are imbedded should be mixed one part Portland cement to two parts of clean, sharp sand. After the completion of the border tile, the body may be then laid on a top coat as already explained. It is preferable in laying tiles to commence from the center of the length and the breadth of the space

to be tiled, working across the width of the floor, to insure having the margin (outside strip of border) of the same width on each side. Then commence laying from the centre in either direction. Keep the foundation wet while laying the tile.

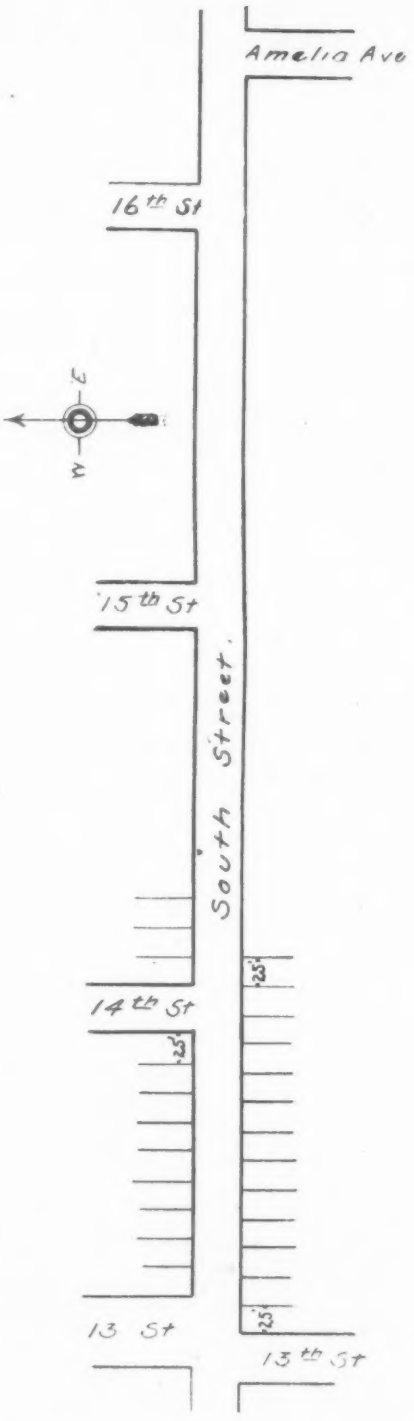
Before laying it is necessary to soak the tiles in clean water at least five to ten minutes prior to the time of their use. Beat down the tiles to a level with the guides, using a flat piece of wood (perfectly straight on its surface) and a mason's hammer. Test the evenness of the surface of the tiles with a straight edge to bear on the tiles and also on the wooden guides. Carefully regulate the joints of the tiles with a small trowel. When the cement has been properly set and the tiles are firm in place, mix pure cement (no sand) with water to the consistency of cream and run same into the joints of the tiles, then wipe off the surface, being particular that no cement remains on the tiles. Fine dry sawdust is most commonly used for this purpose. The tile floor should not be walked on for at least two days after it has been laid.

System of House Numbering.

Will you suggest the proper mode of numbering houses on South street where some of the cross streets do not cross. See diagram. Eighteenth, Nineteenth and Twentieth run across South street. We have used the system of each block being a new hundred, i. e., 1302-1304, etc., to Fourteenth street, then 1402, etc., on left hand side. But there is some difference of opinion as to numbers on the right. Some want to run the 1300's on the right up to Amelia avenue, then jump to 1600 etc., but this looks awkward to me and does not indicate to a stranger the position of a number on the map.

Should the number on the north-east corner of Fourteenth and South streets be 1400 or 1402, leaving out 1400?

JOSEPH A. WILSON,
City Engineer, Lexington, Mo.



House numbers can be made conveniences for two purposes. First, if the city is blocked out by imaginary lines, which follow streets as closely as possible, the house numbers will give the location of the house and its distance from the origin of numbers with reasonable accuracy. If the blocks are of regular size, it will give the distance almost exactly. With numbered streets corresponding with the hundreds of the house numbers the location of the block in which the house stands is greatly facilitated and the house number should always conform with such street numbers. This scheme is described in the article on a house numbering system in the January number, vol. xxxvi, p. 38.

Second, the house numbers should be so located in the block that they can be easily found and so that one conspicuous number found will help in finding one which is inconspicuous on account of its illegibility or lack of light.

If the blocks between streets are equal in length this can be attained by distribut-

ing the numbers throughout the block evenly, so that 1325 or 1326, for example, would always be one-quarter of the block from Thirteenth street. But if the blocks are irregular in length one must become familiar with the length before he can make such a division. So the assignment of a number to each eight or ten feet, say, of length of block will make it comparatively easy to pace off the distance from the corner to the house bearing the number sought for. It is, of course, not quite so easy to locate No. 1350 from the Fourteenth street end of the block in that case, because some of the higher numbers in that hundred may not be used.

Some have tried to make the finding of numbers easy by numbering consecutive houses with consecutive odd or even numbers, but this always gives trouble when new houses are put in or when houses are doubled, and require more numbers, and also because it is desirable for ease in finding numbers to have consecutive numbers practically opposite each other. Thus 1425 should be opposite 1426 or on the lot next west of the opposite lot in the sketch shown. A stranger looking for 1425 would probably pass Fourteenth street in such a case as that shown and expect to find that number on the third or fourth 25-foot lot beyond that street, even if the street does end at South street. No other system makes it so easy to solve the numerous local problems which arise in any system of numbering.

Of course, if numbers were always conspicuous or if it were never too dark to read them, there would be little trouble, and uniformity in numbering on each block is necessary only because of these facts.

Strictly speaking, 1300 belongs in the block with the 1200's, being the last number in that hundred, and the first number on the north-east corner should be 1302. The number 1300 would probably be omitted because of the excess of numbers in all but the very longest blocks.

With irregular streets, such as those shown, the principal difficulty arises, for example, if there were a jog in Sixteenth street, such as there would be if Amelia avenue were called Sixteenth, or if the houses are numbered as though Amelia avenue were called Sixteenth. In such case there may be numbers on the lower 1600's opposite numbers in the higher 1500's. Whatever solution of this problem is adopted there is a departure from some one of the rules above laid down. But whether the numbers are changed to 1600 at Sixteenth street or at Amelia avenue, or one one side at Sixteenth and on the other side at Amelia, the numbers east of Amelia should be brought to the rule of consecutive numbers opposite each other as quickly as possible.

After all, the question of which rule to adopt is not so important as the adoption of some one rule which will be uniform for the whole city. Considerable study of the problem leads to the opinion, however, that the rules above suggested produce the most nearly uniform results, and the adoption of uniform rules by all cities would certainly reduce the amount of strong language used by the many nomadic Americans who find customs so various and house numbers so inconspicuous that any amount of experience is of no avail in finding quickly a given house number.

Terms of Water Works Franchise.

We have a city of 3,000 inhabitants. An ordinance is now pending before the City Council granting a franchise to private individuals to put in a system of water works. As city attorney it is my duty to look after the interests of the city in this matter. I am desirous of obtaining all the information possible relating to systems in towns of this size, both with regard to equipment and regulations as to prices, manner of securing extensions, etc. Your assistance in this will be greatly appreciated. S. F. MORTON,
City Attorney, Fordyce, Ark.

Too often the terms of a water works franchise are made like those in some other city, where the conditions may or may not be different. The contract is one of great and lasting importance and is worthy of the closest scrutiny. It is hardly probable that there is any one in the city government who has had sufficient experience in the financial consideration of water works and in the engineering features to be able to give good advice on the subject. The company proposing the franchise has doubtless had good engineering as well as good legal advice in drawing up the terms of the franchise, and the city will save many thousand dollars and much trouble if it will procure competent advice, which can really be given only after a careful study of the local conditions and of the franchise proposed and consultation with both parties to the contract.

Barring unwarranted assumptions of ability, the value of this advice is likely to be measured by the charge made for it. It is recommended, therefore, that a competent engineer with experience in these lines be employed to aid in the preparation of the contract.

In general such a contract should contain provisions so far as the city is concerned:

Of enough water at sufficient pressure to serve for fire protection, these requirements being subject to change as the needs of the city increase.

Water for city buildings and city purposes generally at a reasonable rate considering the amounts used.

Proper care in cutting into and refilling trenches and replacing pavements.

Protection of the city against damages from any of the operations of the water company.

Supervision of construction by the city.

Penalties for failure to meet all the requirements of the franchise.

So far as the company is concerned the contract should provide for hydrant rental enough to compensate for the expense of supplying water for fire service in full, including all possible items, and for rates for private consumers which will compensate for the full cost of that service, reasonable profits being allowed in both cases.

So far as the consumers are concerned, the rates should be subject to revision as conditions change.

Some of these items and others of great importance are stated in general terms in an article in the department "From Workers in the Field," which gives an outline of an ordinance recommended for the city of Champaign, Ill. The article shows the usual inequality of the two sides in the discussion, the company being provided with engineer and attorney and the city apparently with neither, in the case of Lake Forest, referred to herein. (The article is unavoidably detained until next month).

Too much emphasis cannot be put upon the necessity of expert advice if the city is to protect the rights of itself and of its citizens. If a copy of the franchise were sent with information about the nature of the service and the proposed methods of rendering it, more detailed suggestions might be given; but the final recommendation could be made only after a technical study of the local demands.

An article in MUNICIPAL ENGINEERING, vol. xxxv, p. 36, on "A Modern Municipal Franchise," while it describes a gas franchise, has some food for thought, and one in vol. xxiii, p. 166, on "Franchise Terms and Rights" has much which is directly applicable.

The average water works franchise proves most unsatisfactory to the ordinary city which experiences any material growth, and the argument that a proposed franchise is like others is therefore a very bad one.

Pressures in Water Supply Systems.

Do you publish anything on Water Works, that would give the amount of pressures they carry in different cities in the United States and Canada? If so, please advise and quote prices.

G. J. R., Dayton, O.

Baker's "Manual of American Water Works, 1897," ($4) gives pressures for domestic and fire service in nearly all the cities of the United States. In MUNICIPAL ENGINEERING, vol. xii, p. 359, will be found the ordinary pressures at the pumps in a number of cities. The domestic and fire pressures in a number of cities of more than 100,000 population will be found in vol. xii, p. 1; of a number between 50,000 and 100,000 population in vol. xii, p. 71; and of a number of less than 50,000 population in vol. xiii, p. 86. These numbers can be supplied at 25 cents each.

Rates for Water Service.

I am interested at this time in the subject of ordinances fixing reasonable rates for water service furnished for public and private purposes, and would be pleased to have some information.

JESSE H. SCHAFER,
City Attorney, Washington, Mo.

In the January number of MUNICIPAL ENGINEERING, vol. xxxvi, p. 29, will be found an editorial on "Fair Rates for Water Service," which gives an abstract of the main points in a paper by Leonard Metcalf on the basis for fixing water rates and some comments by the editor. Another article in vol. xxxv, p. 73, gives a more detailed discussion of the same question from a slightly different point of view. In vol. xxxv, p. 12, will be found an article on "Water Rates Charged in American Cities," showing some of the variations in charges and their lack of conformity to the real conditions. An article in the same number, p. 31, gives reports of hydrant rentals charged in many small cities. The conclusion stated in all these cases is that the rates for a given system should be fixed as the result of a study of the cost of supplying water and the probable income, such study to be made by an expert in such work who is independent of either party to the contract and has no direct or indirect interest in the matter.

Ownership of Water Meters.

Can you refer me to any legal decisions as to whether a private water company has the right to charge for the installation of water meters when the contract does not mention that water meters are to be paid for by the consumer, but does state that service connections are to be paid for? I would appreciate your kindness in referring me to any information on this subject you may know of.

W. B., Cincinnati, O.

A number of decisions on this question have been printed in MUNICIPAL ENGINEERING.

In vol. xi, p. 325, is a report of a case involving the return from a meter rate to a flat rate and return of meter deposit which has a very slight bearing on the question.

Several decisions are reported in vol. xiii, p. 307, one to the effect that the San Diego Water Company could not compel the use of meters.

A decision that the municipal plant of Lancaster, Pa., can require the use of meters and apparently that it can require the consumer to pay for the meter is reported in vol. xiv, p. 283.

A discussion of the question with reference to municipal plants by a professor of law will be found in vol. xvii, p. 207.

A decision gives the Memphis Artesian Water Company the right to charge meter rates but the report in vol. xxii, p. 45, does not mention the charge for the meters. A minimum meter rate is upheld in decision abstracted on p. 409, concerning Manitowos Water Co.

A decision quoted in vol. xxiii, p. 263, gives the Buffalo Gas Co. the right to make a charge for meter.

All these decisions are quoted in vol. xxiv, p. 367, with comments by the "Question Department."

There is a decision from Buffalo, vol. xxv, p. 181, denying the right of the city to recover for a water meter destroyed by fire in water consumer's plant.

The right of Newark, N. J., to charge a minimum rate for metered water, which was changed from a former charge of similar amount for meter rent is upheld in a decision abstracted in vol. xxvii, p. 286.

A discussion of meter rates by the editor, based on one in the *Journal of the New England Water Works Association*, which has a slight bearing on the question will be found in vol. xxviii, p. 446.

The relative propriety of a minimum metered water rate and a fixed charge for meter rent is discussed in vol. xxix, p. 178.

There is another discussion of the subject in an editorial on equitable meter rates in vol. xxx, p. 195.

Some decisions and rate schedules supporting the assessment of the cost of meter on the consumer are quoted in vol. xxxii, p. 168.

D. H. Maury discusses minimum meter rates in vol. xxxiii, p. 167.

The variations in the decisions by the courts seem to be caused by the lack of any generally accepted theory of the relation of the functions of the meter to the charges for metered water.

In selling potatoes or grain or oil, there is no thought of requiring the purchaser to furnish the measuring apparatus, which is usually supplied by the seller. However, if it has been customary to sell by other methods and the purchaser demands a measurement, he may be required to supply the apparatus therefor. This is covered in some water rate schedules which provide that the water works management may order in a meter but in that case must furnish it, and also provide that the consumer may demand meter measurement, and in that case he must furnish it.

More frequently there is a minimum charge for water, which is large enough to provide for the expense of the meter.

Theoretically the water company should own its meters and keep them in repair, for its own protection and to prevent the friction which will develop when the consumer fails to repair his defective meter or refuses to pay the bill of the water company for repairing it. Practically, the cost of the meter and its maintenance and operation is a part of the expense of operating the plant and must therefore be paid by the patrons of the plant in one form or another. The meter expense and the bookkeeping expense form a fixed charge for any given size of meter and frequency of reading and presenting and collecting bills, and, together with the readiness of the plant to supply the water service, warrant a definite charge to be paid whether water is used or not. If the charge is made in this way, then there is no good reason for a graduated scale of meter rates until the region of large quantities for manufacturing purposes is reached, when the principles of wholesale prices and favors to manufacturing establishments come in, the latter, of course, mainly in municipal plants. There seems to be some objection to this fixed charge in the form described, so it is more often put in the form of a minimum charge which must be paid if the consumption is below a certain fixed amount, and which does not increase until the consumption passes the limit.

When there is no contract provision fixing the ownership of the meter, it would seem possible to put the matter on the theoretically correct basis, even if the charge is concealed under the term "minimum meter rate."

Machine for Digging Water Pipe Trenches.

I am interested in any matter which pertains to the laying of about eight miles of cast iron water pipe, also any machinery used in the digging, the course being partly through soil and rock, about an equal distance of each. If your magazine makes a treatise on this line I should be very glad to know it. Any information which you may be able to give me will be greatly appreciated.

GEORGE I. YOUNG.

There are several machines that can be used for digging water pipe trenches in earth, but none for excavating in rock is known to the writer. Two machines, one of them specially applicable to water pipe and drain tile trenches are described and illustrated in MUNICIPAL ENGINEERING, vol. xxxiv, p. 333. The machine mentioned has a wheel with excavating buckets attached, and will dig any material which can be excavated with the pick by hand.

See also the "Business Directory" published in each number of MUNICIPAL ENGINEERING under the heading "Trench Machines."

Purifying Contaminated Pipe System.

I request some information on some method of purifying a system of pipes that are used for supplying water to citizens for domestic purposes, that have become badly contaminated. The facts in the matter are, we have a waterworks system here, and during the month of January the system became badly contaminated and as a consequence our little town of some 2,500 people, has about 51 cases of typhoid fever, and more new cases coming down every day. We believe we located the source of contamination and now we wish to purify the system of pipes and supply tank. I give you this information in detail so that you may know what information I am looking for.

J. W. M., ———, Ida.

The writer has not been able to discover any practicable method of doing the

work desired, except to wash the pipes out thoroughly with clean water. It is probable that this can be done readily and thoroughly. Inspection may show that the pipes are badly tuberculated or obstructed by deposits. In this case it would be advisable to clean the pipes. This is a rather expensive and troublesome operation if, as is almost universally the case, no provision has been made for inserting the scrapers necessary and hauling them back and forth in the pipes. This will probably not be necessary. There are one or two machines for this purpose which have been described in MUNICIPAL ENGINEERING, but probably the best results can be obtained by using a home-made scoop hauled back and forth by a rope introduced into the pipe by a float and a cord attached thereto, which the ingenuity of the water works engineer can probably discover how to do under the conditions existing. In a level system it would probably be necessary to use one forced through the pipe by the pressure of water behind it.

Must Canal Companies Build Bridges at Public Highway Crossings.

I am interested in the obligation of canal companies to build bridges for public highway crossings, and would like some information on the subject.

A. C. L., Auburn, Cal.

Can our readers give any information on the subject? In New York the state builds the bridges over the state canals at the highway crossings. In the city of Indianapolis the Indianapolis Water Company now owns the canal which was built by the state for navigation purposes, and uses it for power and to carry water to its filtration plant for the supply of the city. The city claims that the water company should build and maintain the bridges over the canal at street crossings, but the company resists this, and the city has for years constructed the bridges. City officials have recently considered the prospect of success in bringing suit for repayment of the cost of bridges built since a recent statute was passed which, it is claimed, covers the case. A court decision will probably not be obtained for some time if ever.

The question would seem to be one of application of statutes and provisions in charters or franchises on which opinions to be of value must be rendered by attorneys after careful examination of statutes and franchises for each particular case.

Books for Keeping Municipal Accounts.

Having looked over a set of water works books which our City Engineer bought of you, the idea was suggested to me that you might also have in your list of books a complete set of books covering general municipal accounting. If this be true, I will thank you to send me specimen sheets of any system you have for my inspection, as I desire to put in a new and approved system at once. I am the city clerk and tax collector, and as such officer I have the collection of all taxes, privileges, dog taxes, etc.

A. P. L., ———, Miss.

There is so little uniformity in the methods of keeping municipal accounts that there are no standard sets of books for keeping them, except for the State of Ohio. That state has a system of state supervision of accounts of municipalities, and standard forms have been adopted by the Auditor of State. Copies of these forms can be obtained from that office, in Columbus, O., or the books themselves can be purchased of one or two manufacturing stationers in the state. There are sets of books for lighting plants. The most complete set of books is the one referred to, the American Standard Water Works Bookkeeping System, which covers everything from the card application for service to the voucher record distributing expenditures to their proper accounts. The system might be used for gas or electric light plants by changing the headings of columns.

Will our readers who are using satisfactory forms of accounts describe them for the benefit of others?

Specifications for Gravel Concrete.

I am desirous of getting information on specifications governing the mixing, placing, etc., of gravel concrete in the construction of gravity section retaining walls. Can you advise me of any such specifications in print or refer me to information concerning them?

A. C. G., Trenton, N. J.

The "Hand-book for Cement Users" ($3) contains a collection of authoritative specifications for all classes of work. The chapter on specifications for cement work has a set which should be applicable in this case. Those which provide only for broken stone can be used by substituting gravel for stone.

FROM WORKERS IN THE FIELD

Practical Points from Practical People.

Contributions to this Department are invited. Give from your experience for the benefit of others. No matter about the style of the composition, the fact is what is wanted. Use the Question Department for what you want to know; use this Department for what you can tell others.

Prevention of Freezing of Hydrants.

To the Editor of MUNICIPAL ENGINEERING:

Sir:—Referring to letter of "H. E. H." Salamanca, N. Y., in February number, we use a similar method in laying up hydrants for the winter in Au Sable.

We believe, however, our method is slightly better than that mentioned, as we use black oil, which is cheaper and less liable to evaporate or disappear than kerosene. We also put a box about four feet square around the hydrant and fill it with manure. This box has no bottom or top—just sides—and is constructed of 2x12 hemlock lumber. We also put a half barrel over the top of the hydrant which keeps snow away. The outfit is not very beautiful, but it is efficient. It is all removed in the spring and the boxes and barrels are stored until winter.

H. M. LOUD'S SONS COMPANY.
Au Sable, Mich.

Protection of Hydrants from Freezing.

To the Editor of MUNICIPAL ENGINEERING:

Sir: In your February issue appears a letter signed by "H. E. H., Salamanca, N. Y.," which you submit for criticism, in which connection I beg leave to state that any method of filling hydrants with oil is not necessary to go into to any great length, but a brief mention will suffice.

Where hydrants are set in low ground, they do not at all times contain water. There may be times when the ground is more or less free of water and the hydrants will then drain in this ground and the oil will run out. There will then come a snow followed by a thawing, causing the water to bubble up again inside and then a heavy freezing will complete the work. This would necessitate filling with the oil every time a line of hose was used. Fresh oil would have to be put in and in any community where any considerable number of hydrants were in use, a number of fires each day would necessitate too much expense. New York City has an average of 40 fires a day, which is something over 12,000 a year.

The quantity of oil which would be put in the hydrant would be more or less a matter of guess work. In some instances where the hydrants are continually under water, and where the oil is free for use, and the installation limited, it might be of some value. It is far cheaper, however, to utilize more modern methods and plug up the drain hole where hydrants are set in low ground and get rid of the water by applying air pressure. By the means known as the Clark & Cowles method, the water is forced from the hydrant back into the main through the main valve at the bottom of the hydrant by applying a gas or air pressure on the surface of the water in excess of the water pressure. The pressure gauge on the connection near the hydrant shows a drop in pressure when the hydrant is free of water, and the main valve is then closed while the air pressure is still on. Where the hydrants are not set in marshy ground, the opening of the drip valve permits the air pressure to escape, clearing out the valve and eliminating the least trace of water from the hydrant. Being free of water it cannot freeze.

In the case of low ground, the drain valve should be plugged and the water forced back into the main. Itis only necessary to keep the main valve in good order to prevent the hydrant refilling, and as most main valves leak on account of injury from obstructions, sticks, pebbles, etc., sliding into the valve and jamming it, the application of this air or gas pressure drives these foreign substances back into the water main, keeping the valve seat clear.

The time required for testing this system is but a small fraction of a minute, and hydrants may be tested without flushing into the street, and without the indeterminate method of the plumb bob. If the air passes through the drip hole then the hydrant is free from ice.

Should it be desired to open the main valve, the drip immediately closes and the air pressure prevents the water from rising in the barrel and wetting the barrel, to form a shell of ice.

The air or gas pressure is supplied from a steel cylinder filled with liquefied carbon dioxide gas, to which is attached a hose, the necessary gauges and connections. Enough gas is contained in one cylinder to test over 100 hydrants. Fire engines may be equipped with air com-

pressors which may be thrown into service after the fire engine has ceased to pump water, and the compressed air is used to force the water from the hydrant.

It is not necessary to make any change in the hydrant, drill any holes or make any attachment except at the time the test is being made.

A special cap tontaining a check valve is supplied with connections, and this is removed after the water is blown out, and the regular hydrant cap is replaced.

The system described above has been under test by the New York Water Department for over three years. It has been approved by over 20 fire chiefs and an equal number of water engineers in the leading cities of the United States and Canada, as well as representative insurance interests.

E. H. COWLES, New York City.

Natural Hydraulic Cement Sewer.

To the Editor of MUNICIPAL ENGINEERING:

Sir:—In further reply to your inquiry I learn that the use of cement pipe in Brooklyn was begun about forty or forty-two years ago, the material, natural hydraulic cement. The first cement pipe used was circular, without the flat base. About thirty-five years ago the flat base pipe was introduced. Portland cement was first used in the construction of sewers in Brooklyn in 1902.

Consulting Engineer, Brooklyn, N. Y.
JOSEPH STRACHAN.

Cost of Asphalt Patching at Marion, Ind.

To the Editor of MUNICIPAL ENGINEERING:

Sir:—Being very much interested in the article in MUNICIPAL ENGINEERING pertaining to Mr. Sam R. Murray's report on the repairing of asphalt streets in the city of Indianapolis, I herewith enclose data on our repair work, throughout the month of September, 1908, which is a very good average of the season's work, after the force was thoroughly organized and all equipment put into service.

You are well aware that a city of the size of Marion could not afford a plant costing upwards of $20,000.00 which would possibly remain idle eleven months out of the year; so we must look for a smaller and less expensive repair plant. We have in our city 6.64 miles of asphalt streets, or 123,496 square yards, and the first street was constructed in 1899 and the last in 1902. While we have some excellent asphalt streets, some are much below the average. We found in past experience, that to rely on the asphalt company to do our repair work, it was necessary that our streets should become quite bad, before any company would agree to come in to do our repair work, as the repair yardage was so small that it would not pay them to move their plant to our city; so we could expect them once in two or possibly three years, even though the street was under guarantee.

In the spring of 1908, even though two of our streets were yet under guarantee, our Board of Public Works came to an agreement with the Barber Asphalt Co., that the slate should be washed, that is, the city to take care of all streets under guarantee and that the Barber Asphalt Co. would relinquish all retainer claims that they held against the city.

In the meantime, three of our streets became quite bad, so we began to look about for some relief, and finally purchased one of Hooke's largest combined asphalt plants, and a car load of asphalt, but I soon found that this plant alone was somewhat tedious, for the amount of work we had to do, so I had another pan made, also had a 700 pound hand roller made, and with this addition to the plant, we were able to push the work more rapidly.

We began work July 20, 1908, and finished or rather ran out of material, Nov. 23, 1908. While not working quite all the time, we laid 4,142 square yards of patch work, and I must state that it is almost impossible to detect many places where patches were made, as we were very careful about the work. We used the Acme asphalt which came already fluxed; used three grades of sand, so as to obtain as nearly a standard mix as possible, as well as to make the mixture as dense as possible.

We used Portland cement as a filler, instead of stone dust, which caused the price per sq. yd. to run up somewhat higher than it would have had stone dust been used. We had two experienced men in the gang and paid them 25 cents per hour, all other men were paid 20 cents per hour. We used a one-horse dump cart for hauling material from stock room to plant, also hauling prepared material to street, and cuttings or old asphalt away, usually hauling same on some nearby street as repairing material. We paid cart man 27 1-2 cents per hour.

Our full gang consisted of eight men, (three out on the street and five at the plant) and a one-horse cart and driver. Orders were given to work until the pans were cleaned and filled with sand at the end of each day's work, ready for fire the next morning. Four-foot wood was generally used for firing, costing $5.50 per cord, yet we used some shorter wood, paying $1.75 per cord. The Portland cement cost $1.40 per barrel; sand cost $0.75 at the plant; and the asphalt cost $30.00 per ton, f. o. b., Marion.

Last season was an excellent one to do repair work on account of there being but little rain. The sand should be kept as dry as possible, and therefore should be covered at night, and at day time in case of rain, as this will materially assist in the progress of the work as well as save much fuel.

The plant should be located at some

convenient point, near where considerable patching is to be done; yet care should be taken not to move the plant too frequently, as this expense will cause the price per square yard to rise quite rapidly. We were able to get out eight batches per day, providing every thing worked well. I shall enlarge our mixing pans before beginning our work this season, and by so doing will be able to increase the output fully twenty-five per cent. and by using stone dust instead of Portland cement for filler, will be able to cut the price down to at least $0.75 per square yard or perhaps lower.

In tabulating, I give the daily report throughout the month of September, 1908, showing cost of various materials used and labor cost, also showing total cost of plant, and allowing interest on plant investment at 6 per cent., making total charge against the 60 days, as average time plant will be in use each season, also depreciation at 10 per cent. for the same period. There has been nothing allowed for superintendence of the work, as you will note, as either the city engineer or his assistant will have time to see that work is going on as it should; however, last season I gave this work quite considerable attention, measuring all patches made, as I desired to know just what it was costing per square yard.

Now I trust that our work may not be compared as to cost with the work in the city of Indianapolis, as it is the smaller cities that will always suffer in caring for their asphalt streets.

I do not anticipate that we will have as much repair work in the next two seasons as we had last season. I understand that one of our neighboring cities has purchased a plant costing about $11,000.00, and having possibly about the same or a little less number of square yards of asphalt to maintain as we have in our city. I do not see any economy in a plant of that kind, and I would suggest as a compromise between the extremes that four or five cities in close proximity, join in purchasing a plant that could be moved from one city to another, making the plant as nearly portable as possible. This would divide the cost of the plant as well as dividing amount of interest and depreciation charges.

This plant could be used in resurfacing as well as patching, and no doubt satisfactory arrangements could be made, as to time that each city was to use the plant, as ordinarily from two to three weeks would be sufficient time for doing the patch work at any one place, yet in case of resurfacing, from four to six weeks might be consumed.

I should be pleased to have this matter thoroughly discussed, as the keeping of our asphalt streets in repair in the smaller cities is surely a continual drain on the general fund.

T. E. PETRIE,
City Engineer, Marion, Ind.

DAILY REPORT OF MARION ASPHALT PAVING PLANT.

Date, Sept., 1908.	No. of Sq. Yds. Laid.	Cost of Labor at 20 and 25 cts.	Cost of Asphalt Including Freight at $30.00 Per Ton.	Cost of Sand at Plant. 75c Per Yd.	Cost of Cement $1.40 Per Bbl.	Cost of Fuel. $5.50 Per Cord.	Cost of Cartage. 30 Tons of Asphalt.	No. Cubic Feet.
1	59.9	$20.15	$14.56	$3.00	$4.20	$3.12	$0.48	117 1-3
2	54.7	20.15	14.56	3.00	4.20	3.12	0.48	117 1-3
3	54.7	20.15	12.74	2.62½	3.67½	2.73	0.42	102 1-3
4	66.0	20.15	14.56	3.00	4.20	3.12	0.48	117 1-3
5	60.3	20.15	14.56	3.00	4.20	3.12	0.48	117 1-3
8	58.7	19.35	14.56	3.00	4.20	3.12	0.48	117 1-3
9	59.8	20.15	14.56	3.00	4.20	3.12	0.48	117 1-3
10	58.2	20.72	14.56	3.00	4.20	3.12	0.48	117 1-3
11	30.8	20.15	9.10	1.87½	2.62½	1.95	0.30	73 1-3
12	41.4	20.15	14.56	3.00	4.20	3.12	0.48	117 1-3
14	52.9	20.15	14.56	3.00	4.20	3.12	0.48	117 1-3
15	60.6	20.15	14.56	3.00	4.20	3.12	0.48	117 1-3
16	56.6	20.15	14.56	3.00	4.20	3.12	0.48	117 1-3
17	53.2	20.15	14.56	3.00	4.20	3.12	0.48	117 1-3
18	56.2	20.15	14.56	3.00	4.20	3.12	0.48	117 1-3
19	56.0	20.15	14.56	3.00	4.20	3.12	0.48	117 1-3
21	56.6	20.15	14.56	3.00	4.20	3.12	0.48	117 1-3
22	50.3	20.15	14.56	3.00	4.20	3.12	0.48	117 1-3
23	52.0	20.15	14.56	3.00	4.20	3.12	0.48	117 1-3
24	54.5	20.15	14.56	3.00	4.20	3.12	0.48	117 1-3
25	60.8	20.15	14.56	3.00	4.20	3.12	0.48	117 1-3
26	53.0	20.15	14.56	3.00	4.20	3.12	0.48	117 1-3
P.M. 28	19.5	10.15	5.46	1.12½	1.57½	1.17	0.18	44
29	48.2	20.15	14.56	3.00	4.20	3.12	0.48	117 1-3
A.M. 30	33.3	10.27	7.28	1.50	2.10	1.56	0.24	58 1-3

COST OF PLANT:

Hooke's combined fire wagon and asphalt heater	$465 00
Freight	42 00
Extra pan	43 00
Hand roller	65 00
Hand cart	10 00
Total cost of plant	$625 00

Depreciation at 10 per cent., $62.50 for season of 60 days, or $25.72 for the 25 days of September.

Average depth of repair work, 2 inches.

SUMMARY:

No. of days work in report 24 in 25 days time.

No. of square yards laid	1,308.0
No. of cubic feet laid	2,742.0
Cost of labor	$ 483 64
Cost of asphalt	340 34
Cost of sand	70 12
Cost of cement	98 17
Cost of fuel	72 95
Cost of carting asphalt	11 22
Interest on investment	15 00
Depreciation	25 72
Total cost	$1,117.17
Cost per square yard	$0.854
Cost per cubic foot	$0.407

Water Storage Projects for New York State.

In its annual report to the senate the State Water Supply Commission urges the storage of water by the state for the development of electrical power in the State of New York. The early beginning of one or more units of development is believed to be advisable by the commission, which for two years, under the Fuller act, has been making a careful study of the water power resources of the state.

The commission reports that the time is not ripe for the state to install power plants and engage in the business of developing electricity, but that it should proceed to plan to build enormous reservoirs for water storage purposes and flood prevention on the upper Hudson, the Genesee and Raquette rivers.

The commission makes the statement that the cost of these great storage reservoirs, it has reason to believe, would be willingly borne by the property owners benefited, and that they could pay a fair rental to the state for all time, if they were assured of a permanent source of power.

MUNICIPAL MATTERS IN COURT

Higher Courts — Who Pays For Water Meter — Parks A Utility — Eighty-Cent Gas—New York Harbor Pollution—Knoxville Water Rates

Decisions of the Higher Courts of Interest to Municipalities.

PREPARED BY JOSEPH W. KENNEY, ATTORNEY, INDIANAPOLIS, IND.

Accumulations of Ice Upon Street — Damages.—A city is not liable for injuries from mere general slipperiness of its streets and sidewalks occasioned by recent fall of rain or snow. But a city is liable for injuries to a person slipping on ice in a street or sidewalk, which has accumulated by reason of a defect in the street or walk, or by reason of the city's neglect to construct and maintain suitable drains to carry off the water. The city's obligation is to keep its streets and sidewalks in a reasonably safe condition, so that pedestrians exercising care may use the walks with safety. (Holberg v. City of Philadelphia [Pa.], 70 A. 746.)

Illegal Contract by Commissioner.—A contract by a commissioner of a city department with a higher bidder for public work, after the rejection of the lowest bid for non-observance of an unauthorized regulation of the commissioner, is illegal and void. (Daly v. O'Brien [N. Y.], 112 N. Y. S. 304.)

Improvement of Street — Exclusive Power in City.—The time and manner for improving a city's streets are matters exclusively for the legislative department of the city, and until that body acts, the city has not acted; and the fact that the abutting owners constructed a sidewalk does not prevent a city from ordering the construction of a sidewalk under a statute allowing it to order the original construction of a street improvement at the cost of the abutting owners, though it had knowledge that the owners were making the improvement. (Guilfoyle's Ex'r v. City of Maysville [Ky.], 112 S. W. 666.)

Validity of Ordinance.—An ordinance to be void for unreasonableness must be clearly unreasonable and there must be evidence of weight that it was enacted by mistake or in a spirit of fraud or wantonness. (City of Seattle v. Hurst [Wash.], 97 P. 454.)

Ordinance—Use of Street.—Where the privilege of the use of a public street of a municipality is granted by an ordinance, which is accepted and acted on by the grantee of the privilege in some substantial manner, the ordinance is a valid and binding contract and is not subject to revocation by the municipality. (Village of Madison v. Alton, G. & St. L. Traction Co. [Ill.], 85 N. E. 596.)

Use of Streets for Public Benefit.—Municipalities hold their streets in trust for the public use and benefit and they must control and improve them for such users, and they cannot grant their exclusive use to private individuals or corporations, nor can they make any contract that will relieve them from the performance of their duties to control and improve the streets for the public use. (Idem.)

Street Railway—Grant of Right of Way.—The city council of a city, having charter authority to permit street railway lines to be built and to designate the route and grade thereof, the exercise of judgment by the council in directing that a street railway line should be laid east of the center of a street, could not be interfered with by the courts, in the absence of a showing of a fraudulent or manifest abuse or oppressive exercise of power. (Wagner v. Bristol Belt Line Ry. Co. [Va.], 62 S. E. 391.)

Invalid City Bond Issue Legalized by Legislature.—Where a municipal corporation has made a contract not within its statutory powers, which the legislature might have legally conferred upon it, the legislature may subsequently legalize the contract; and, where an issue of city bonds was invalid because increasing the city debt to more than 10 per cent. of the assessed value of property in the city, in violation of Revisal 1905, Section 2,977, the legislature had power to legalize the issue by a subsequent act irrespective of the limitation. (Wharton v. City of Greensboro [N. C.], 62 S. E. 740.)

City's Power to Incur Indebtedness for Sewer Assessment.—Constitution article 13, forbidding a city to become indebted "in any manner or for any purpose" in excess of 2 per cent. of the taxable property, operates upon an indebtedness without regard to the necessity therefor and its form. * * * The obligations of a city for its portion of the cost of a sewer arises when the sewer is completed and accepted by the city within Const. Art. 13, (forbidding a city to become indebted in excess of 2 per cent. of the taxable property) and is not postponed until the final estimate under Towns and Cities Act, 1905 (Burns 1908, Sec. 8,725) of the benefits resulting to the city is made and an assessment therefor levied against the city. (City of Logansport v. Jordan [Ind.] 85 N. E. 959.)

Surface Water on Highway.—Nuisance.—Where an owner by means of spouts on his building, collected water from the roof thereof and turned it on his concrete walk, from which, because of the natural grade, it flowed to a public sidewalk, where it froze into a ridge about three inches in thickness, a finding that he created a nuisance and was liable for the consequent damages, was warranted. (Field v. Goudy [Mass.], 85 N. E. 884.)

Convention Hall a Public Utility.—A convention hall to be owned, controlled and used exclusively by a city to accommodate public gatherings of the people, and for such other public uses as may be designated by the mayor and council, is a public utility within the meaning of that term, as used in constitution, Art. 10, Sec. 27, authorizing incorporated cities or towns to become indebted for the purpose of purchasing or constructing public utilities. (State v. Barnes [Okla.] 97, p. 997.)

Overflow of River—Declared Nuisance—City Must Abate.—Under Buffalo City Charter, Sec. 395, requiring the city to abate nuisances and laws 1906, p. 1,439, c. 527, Sec. 1, declaring that the periodic overflow of the Buffalo river within the city and the flooding of adjacent lands is a public nuisance, and authorizing the city to abate the same, the city is liable for its refusal to abate a nuisance occasioned by the periodic overflow of the river and the flooding of adjacent lands, where it can abate the nuisance with reasonable cost, and where it has assented to the placing of obstructions in the bed of the river which increased the damages to adjacent owners arising from such nuisance. (White v. City of Buffalo, 112 N. Y. S., 485.)

Objection to Sewer Not an Objection to Defective Notice to Construct.—Where a property owner appeared before the City council in local assessment proceedings, and made objections to the proposed sewer he thereby waived defects or irregularities in the notice of intention to construct the sewer. * * Code, Sec. 810, provides that the resolution of intention, in assessment of proceedings for local improvements, shall state whether abutting property shall be assessed, and section 824 provides that all objections to errors, irregularities or inequalities in special assessment proceedings, not made before Council at the time and in the manner provided, shall be waived. Held, that a property owner waived an objection that adjacent property was not assessed, by failing to make that objection when he appeared before the Council to object to the construction of the sewer, and in response to the notice of assessment, the failure to assess adjacent property not being jurisdictional, but a mere irregularity which could be waived. (Andre v. City of Burlington [Iowa], 117 N. W. 1,082.

Prerequisites to Constructing Sidewalk—Injunction.—Where in a suit to enjoin a town from enforcing a notice to rebuild temporary sidewalk, the court found that

the town had not complied with necessary prerequisites, and it was undisputed that defendant was intending to proceed pursuant to the notice without complying with such prerequisites, complainant was entitled to an injunction restraining interference with his walk until all legal prerequisites had been complied with. (Converse v. Incorporated Town of Deep River [Iowa], 117 N. W. 1,078.

Contract—For Sewer and Disposal Plant Divisible.—A contract for the construction of a sewer and its appurtenances and of a sewage disposal plant is divisable, so that the provision for the sewer and its appurtenances can be sustained, though the provision for the disposal plant is void, where the municipal authorities intended to have the two improvements separable, and the advertisement soliciting bids stated that the "contracts" would be let and the bids for the sewer were kept separate from the gross sum for constructing the disposal plant, and on striking out everything pertaining to the disposal plant a complete contract for the sewer is left. (Uvalde Asphalt Paving Co. v. City of New York, 112 N. Y. S. 535.)

Charge of Assessment Installment.—In order to charge an installment of an assessment with expenses made in connection therewith, it is essential that the city show the facts from which the propriety of such charges may be determined. (City of Chicago v. Union Trust Co., 138 Ill. App. 545.)

Leader Pipes—Discharge of Water Upon Sidewalks.—A by-law of a town providing that no person shall permit water from the eaves or leader pipes of any building to be discharged on the sidewalk, or permit any drain or conduit on his land to discharge water on the sidewalk, does not alone prohibit direct and immediate discharge of water on a sidewalk, but includes cases where the house, standing back from the street line, is so fitted with eaves and leader pipes that the collected water flowed with accelerated volume to the highway, and a concrete walk from the house to the street may act as a trough to carry water from a spout on the house to the sidewalk. (Field v. Goudy [Mass.] 85 N. E. 884.)

Invalid Assessment—Time of Objection.—Where a City Council was wholly without power to order the paving of an alley at the expense of abutting owners, its proceedings for that purpose were void, and a property owner was not estopped to assert the invalidity of the assessment by the fact that, being a resident of the city, and having knowledge of the proceedings, he did not protest until notified of the assessment. (Bradley v. City of Centerville [Iowa,] 117 N. W. 968.)

Repeal of Vacating Ordinance Does Not Re-open Alley.—The repeal of an ordinance vacating an alley could have no effect to re-establish the alley; that being only possible by following the method prescribed by code. Sections 751, 880 or by prescription or dedication (idem.)

Change of Grade—Court's Jurisdiction.—Courts are precluded from inquiring into the advisability of a change of grade of streets of a municipality; the public use being the dominant interest, of which the municipal authorities are the exclusive judges. (Dorsey v. Town of Henderson [N. C.] 62 S. E. 547.)

Shall City or Consumer Pay for Water Meter.

The Wisconsin Rate Commission rendered a decision recently to the effect that a city has no right to compel a consumer to purchase or rent a meter, much less any particular type of meter. This decision will make some difference to water users concerning the purchase of meters, as it has been a custom in some of the cities of that State, heretofore, for a water user to rent a meter if he wanted to pay for the water he used on a basis of measurement, as the water company did not furnish meters.

It is recalled, however, that in 1903 Justice Marshall, of the Supreme Court, rendered a decision in the Hallauer water case at La Crosse, which this decision, if enforced, would over-rule.

In the charter granted to the city of La Crosse, Wis., the Common Council was authorized by ordinance to make and enforce all needful regualtions for ascertaining the amounts to be paid as water rates by persons using the water, and necessary and expedient to protect such water works and the use thereof. The whole scheme of the charter provision was that the consumer should bear all the expense necessary to enable him to take water from the public supply in the water mains. A requirement contained in an ordinance adopted by the Common Council, that the consumers in certain cases, at their own expense, provide and use meters and keep them in repair, was held to be within the powers given the Common Council under the charter by a decision of the Supreme Court upon a review of the ordinance.

In such case the provisions of the ordinance requiring consumers using service pipes above a certain diameter to furnish meters, and leaving it optional with consumers using service pipes below that diameter, is not as a matter of law an unreasonable classification. (State ex rel. Hallauer v. Gosnell, 116 Wis. 606.)

A Public Park is a Public Utility.

Justice Hays, of the Oklahoma supreme court, handed down a decision, February 2, sustaining the District Court of Logan County in the mandamus writ issued requiring Mayor Barnes and Ed. Kinnan, City Clerk, to execute the $30,000 street improvement bonds for the paving of Capitol square, in Guthrie, in favor of the J. H. Hill Contracting Company. The

validity of the bonds was upheld in every instance. This was a test case to determine whether bonds so voted came within the term "public utility" as used in Section 27 of Article 10, of the constitution, which the Supreme Court holds in the affirmative, declaring that a public park (like Capitol square) is a public utility.

New York's Eighty-Cent Gas Rate Confirmed.

The United States Supreme Court denied, February 1, the application of the Consolidated Gas Company of New York for a rehearing. The case involved the validity of the eighty-cent gas law and was recently decided against the company and in favor of the law. On the ground that the decree of the court was inconsistent with some of the conclusions in the opinion, the company applied for a rehearing. The effect of the denial is to leave Judge Peckham's decision standing in full force.

Sewage Purification Plans for New York Harbor.

The United States Supreme Court rendered a decision January 25 in favor of the government in the suit brought by the United States to be made a paramount party to the litigation between the states of New York and New Jersey over the proposed $12,000,000 Passaic Valley trunk sewer project.

The New Jersey Commissioners designed a large conduit to dispose of the sewage of the Passaic Valley by discharging 120,000,000 gallons a day into the Upper Bay, about one-half mile north of Robbins Reef, on the westerly edge of the Main Ship Channel. The project was fought by the State of New York in the interest of its own harbor and the rivers around Manhattan.

As a result of the decision the execution of the original plan of the New Jersey commissioners will be prevented. To receive permission to carry the trunk sewer into the bay they will have to adopt some plan for the removal from the sewage discharge of the solid matter.

A plan for such a method of treating New York city's sewage has been submitted to Mayor McClellan by Edward Hatch, Jr., chairman of the Merchants' Association Water Pollution Committee, and is a comprehensive scheme of sewage disposal for the city that will cost about $32,000,000. The object of the scheme is to do away with existing features of water front pollution. The committee proposes two plans; one for cross streets and the other for marginal streets, providing for placing disposal tanks beneath cross streets and for those for the marginal streets to extend from the street line to the dock sheds, with the tanks beneath the surface of an open plaza.

Both plans provide a screening and sedimentation process which will remove from 50 to 65 per cent. of the solid material in suspension. The clarified sewage is to be pumped by automatic pumps which will lift the sewage from the tanks at certain or all stages of the tide, according to the grade of the street. Automatic valves will close the outlets against the tide, and a system of electrical apparatus will operate the works and control the gates, to prevent flooding. The screenings or settlings in the catch-pits can be removed through the openings in the street and carted away or incinerated. The sludge from the sedimentation tanks is to be "squeegeed" to a storage tank at the bulkhead line, from which it will be drawn by suction into a sludge steamer and taken well beyond Sandy Hook Lightship and dumped. If sea disposal is not used sludge presses may be employed and the product burned.

The estimated cost of a cross street plant is about $200,000; that of a marginal street plant less in proportion. There are now about 160 sewer outfalls, each being the final discharge from a group of sewers. The cost of equipping these in accordance with the plan would be about $32,000,000. To this is to be added the expense of maintenance of the plants and the sludge steamboats or scows.

Knoxville Water Rates are Equitable.

The United States Supreme Court rendered a decision early in January in the Knoxville Water Company case, which involves the Birdsong water rate ordinance. The court sustained every principle for which the city contended, and held that the consumers are entitled to rebates, to conform to ordinance. The court held that "as the case now stands, there is no certainty that the rates now prescribed in the Birdsong ordinance, will necessarily have the effect of denying the Knoxville Water Company such a return as would avoid confiscation."

The Knoxville Water Company has appealed to the United States Supreme Court for a rehearing, contending that the court overlooked certain contracts between the company and the city, and also that the rate sustained by the court would prove confiscatory in that it would give a return to the company of less than 6 per cent. interest on its investment.

Counsel for the water company claimed that the only part of the decision in the Knoxville water case reaching the issue was the last part, wherein it was stated that the Birdsong rates had not been tried, to find if they could be maintained at a profit, and until those rates were tried and proved, that the court could not say whether they were reasonable.

The Birdsong ordinance provides for a 20 per cent. reduction from the rates charged in 1901, and under the decision water consumers can claim rebates for any over-payments that have been made.

MUNICIPAL AND TECHNICAL LITERATURE

Salt Lake City Water Works—Cedar Rapids Improvement—New Publications

Salt Lake City Water Works Report.

The annual report of Thomas Hobday, superintendent of water-works at Salt Lake City, shows that that city has 61,756 water users. The water assessment for the year beginning July 1, 1908, and ending July 30, 1909, is $131,942.20, an increase in the revenues from this source last year of $21,610.80. The supplemental assessment, made between July 1 and December 1, 1908, amounts to $9,357.95, and the meter assessment for the same period to $26,446.43, making the total assessment to December 31, 1908, $167,746.56. Almost 4 miles of water mains have been laid under contract, and the water-works department has laid 1,668.10 feet during the last year, making a total of 167.25 miles, with 2,039 line valves, 937 secondary valves, 1,344 hydrants, and about 13,000 water taps in the system.

Civic Improvement of Cedar Rapids.

The civic improvement and beautification of Cedar Rapids, Iowa, is the subject of a recent report by Charles Mulford Robinson to the Mayor and City Council, which has been issued in a pamphlet with illustrations of conditions and possibilities, and a map defining the lines of the projected improvements.

Mr. Robinson makes his recommendations in groups devoted to changes in the street plan, additional parks and park connections, and local improvements and corrections.

Foot notes to the report, which was made in July, 1908, state that some of the improvements recommended are already accomplished and others are under way, such as proceedings for the purchase of Sunset Park, placing of street signs, purchase of street waste cans, parkway in First avenue, replacing of animal house in park with stone, concrete and steel dens, sale of old City Hall and purchase of island for new City Hall site. It is evident, therefore, that Mr. Robinson's visit has brought quick returns, although years will be necessary to carry out all the projects he outlined.

New Publications.

Asphalts, Their Sources and Utilizations; Asphalt for Dustless Roads; Recent Improvements in Asphalt Industries; Together With Addenda Treating on General Waterproof Construction. By T. Hugh Boorman, Civil Engineer and Asphalt Expert. Cloth, 168 pp. $3.

The basis of Mr. Boorman's book is a series of articles running through a periodical for a year, to which have been added some chapters bringing them down to date, and some treating of other uses of asphalt. The book is largely historical and descriptive, and first covers the various kinds of asphalt in chapters on rock asphalt mastic or asphalt coule, Trinidad asphalt, petroleum residuum and California malthas as fluxing materials, Venezuelan and Cuban asphalts, American bituminous limestones and sandstones, manjak, uintaite, Turkish and other bitumens, and later developments of European asphalts.

One chapter, largely quoted from W. H. Delano, sketches the development of uses of asphalt up to 1903, and another by the author, brings the history down to date. Mr. Delano's chapter is devoted largely to European asphalts and the small use of American asphalts in Europe, and the author's chapter mainly to asphalts of the United States. Uses in paving have the most attention in these chapters.

The author then takes up the uses of asphalt in building construction for waterproofing, roofing and various manufacturing industries, and devotes several chapters to the applications of asphalt and asphaltic oils to highways under chapters on dustless roads, methods of surfacing roads, asphaltic oil classification and properties, application of asphaltic oils (to macadam, gravel and earth roads), sprinkling with asphaltic oils, latest views of congress on asphalt surfacing at the 1908 Good Roads Convention.

The author pays MUNICIPAL ENGINEERING *the* compliment of quoting in one chapter an article by its editor upon municipal asphalt plants and the cost of operating them.

The volume closes with a brief chapter on asphalt machinery.

The author has very properly left to books already in use the technical discussion of asphalt pavements, and will treat more fully of roofing in a book upon that subject exclusively, which has been announced. His consideration of the dustless road question is quite detailed as to methods and results, and his treatment of other uses of asphalt than those above named is the most complete which has yet appeared.

He may be said therefore, to give a good general view of the whole asphalt field, and the best view to this time of the special parts of the field which have not already been treated in full by others.

Water Power Engineering. The Theory, Investigation and Development of Water Powers. By Daniel W. Mead, M. Am. Soc. C. E., Consulting Engineer and Professor of Hydraulic and Sanitary Engineering, University of Wisconsin. Cloth, 787 pp. $6. McGraw Publishing Co., New York City.

With his accustomed thoroughness, Professor Mead has given us in this book the best collection which as yet appeared of discussions of most of the problems involved in water power engineering.

There have been excellent monographs on dams and reservoirs, mathematical treatises on hydraulics and hydraulic machinery, each of them requiring a good-sized book. Probably on this account these subjects are treated but briefly, and the present book is most directly applicable to the work of the engineer who wishes to investigate the possibilities of a proposed development of water power and then to work out that development, getting assistance from other engineers or other books in designing the details of the apparatus and principal structures.

The author's reputation for reliability is so fully acknowledged that it is only necessary here to give an idea of the ground covered by the book, that our readers may know whether it is in their field, for if it is they will certainly find it indispensable.

The introductory chapters give a short history of water power development, mainly the development of water wheels; a discussion of the generation of power, the efficiency of its application, the reasons for losses; a brief mathematical statement of the principles of hydraulics, with tables and most convenient diagrams for solving the problems of flow of water in channels and pipes, through orifices and over weirs.

Some chapters are devoted to the various phases of a water power problem, beginning with the study of the flow of the stream in all its details in two chapters; rainfall and methods of studying its variations; the disposition of rainfall by evaporation; run-off and the relations of run-off and rainfall under all conditions of weather, time, topographical conditions, etc., in two chapters; the flow of this run-off in the stream and the effects of variations in conditions of bed, slope, ice-cover, etc.; and the methods of measuring stream flow.

Water wheels and their accessories are discussed in many chapters covering the classifications of wheels and definitions and descriptions of various classes and individuals; details of turbines and their appurtenances, such as bearings, gates, draft tubes; a brief and clear exposition of the principles of the practical hydraulics of the turbine, with many tables and diagrams giving results of tests, of assistance in designing wheels and selecting them for various purposes; the methods and results of tests of turbines and value of the tests; the basis for the selection of turbines for various given conditions and possibilities of variation, with many diagrams of characteristic curves of various makes of wheels.

The load curve and load factor and their influence on the design of the power plant are given their measure of attention.

Methods of regulating speed of turbines by governors, fly-wheels, standpipes and air chambers; and detailed descriptions of various types and designs of governors, and their connections and relief valves are given in two chapters; and another discusses the arrangement of the reaction turbine.

The selection of machinery and the design of the plant are briefly summarized in one chapter, which is followed by a number of examples of existing water power plants briefly described.

The relation of the dam and the power station, the principles of construction of dams, appendages to dams, pondage and storage, are the chapters on the methods of controlling water in streams for power purposes.

The financial side is considered in chapters on cost, value and sale of power, and the investigation of water power projects.

Appendixes give detailed mathematical discussions of water hammer, speed regulation and the standpipe, and test data of turbine water wheels of many varieties. There is also one on the effect of an "umbrella" upon the formation of vortices, one giving tables of evaporation observations, one describing two new water wheel governors, and one giving a number of miscellaneous tables.

The index fills twenty-nine double column pages and is apparently sufficient. Each chapter is followed by some pages of references to articles in periodicals, papers in society proceedings and to books in which further detail can be obtained.

The author deserves the commendation of engineers for his comprehensive treatment of nearly the whole of a subject which has heretofore been obtainable only from the greatly scattered sources named in the references mentioned, and for his own original work, not the least important of which is the arrangement of data of observation and experiment in such form that they can be easily and accurately used by engineers in the study of their problems.

Specifications and Contracts. A series of Lectures Delivered by J. A. L. Waddell, Including Examples for Practice in Specification and Contract Writing, Together with Notes on the Law of Contracts by John C. Wait. Cloth, 169 pp., $1 net. The Engineering News Publishing Co., New York.

The publishers have collected in this volume lectures delivered by Mr. Waddell

at the Rensselaer Polytechnic Institute and at other engineering schools, which were very favorably commented upon at the time they were delivered, and which should be in the hands of every engineer interested in the drawing of specifications and the making of contracts whether for construction or for his own services. To these lectures have been added skeletons of specifications and contracts for the practice of students in drawing up the complete documents. Mr. John C. Wait, whose book upon the law of engineering contracts is a standard in this field, has added a number of pages of notes upon the law of contracts prepared expressly to elucidate Mr. Waddell's work and discuss its provisions.

The result is a most valuable guide for the practicing engineer. While the work is apparently designed as a text-book for engineering schools, much of it is beyond the student's experience too far to have its full effect until he has been in practice for some time, but it will serve to give him an idea of the magnitude of the work ahead of him, until the value of the book as a guide through difficult paths is recognized.

The low price is made on account of the desire of the authors that the book shall find its way into the hands of as many students and engineers as possible.

One possible secondary result, which may not be altogether satisfactory, is the development of promoters of enterprises among engineers. The two lines usually call for different qualifications, and this combination may lead to unfortunate results, except in the few cases where one man combines the two sets of characteristics.

Die Portland Zement Fabrikation. A Hand-book for Engineers and Cement Manufacturers. By Carl Naske. Second Edition, Revised and Enlarged. Paper, 410 pp., 361 Cuts, and Many Tables. 17 Marks. Cloth, 18.50 Marks. Theod. Thomas, Leipzig, Germany.

The first edition of this book appeared in 1903 and was reviewed in MUNICIPAL ENGINEERING, vol. xxv, p. 201. The present edition has been increased in size by one-third and obsolete matter has been omitted, so that it is now fully up to date, and covers modern processes of Portland cement manufacture as developed in all countries. Its only drawback to many Americans is the fact that it is written in German.

The subject is divided into five parts, the preparation of the raw materials, 105 pages; the process of burning, 59 pages; grinding, storing, packing, and related operations, 117 pages; properties and methods of testing, 58 pages; complete or abstracted specifications from nine European and North American countries, 66 pages; and the indexes occupy 5 pages.

There have been improvements all along the line, and they are well stated in the new material added to the volume.

ORGANIZATIONS AND INDIVIDUALS.

Illinois Good Roads—Nebraska Cement Users—Museum of Safety—N. A. C. U.—Technical Meetings—Engineers Want Positions—Civil Service Examinations—Civil Service Exemptions—Personal Notes

Illinois Good Roads Convention.

The National Good Roads Association held an Illinois convention at the Auditorium Hotel, Chicago, February 12. In a paper on "National Aid for Good Roads," H. H. Gross, secretary of the Farmers' Good Road League, advocated the furnishing of financial assistance by the Federal Government and the taking up of road improvement as a national policy.

Arthur N. Johnson, State highway engineer, submitted a paper on "Existing Laws and Needed Legislation for Good Roads in Illinois." The towns in Illinois are, as a rule, far apart and there is no interurban traffic on the roads. The traffic census shows that the traffic decreased rapidly with the distances from the towns. The towns are closer together in Eastern States, like Massachusetts and New York, and there is enough interurban traffic to warrant the construction of State-aid road systems. In Illinois, Wisconsin and Missouri the work of the State is mainly advisory—to inform the local authorities as to proper methods, but leaving each community to take care of its own roads. Unfortunately, a general impression prevails that no skill is necessary in building and maintaining roads; in fact, maintenance is practically ignored.

The Illinois State Highway Commission

undertakes to give advice and technical assistance in road building. It supplies broken stone when necessary, the stone being crushed, screened, etc., by convict labor at the Joliet penitentiary. This does not conflict with private interests, as it is distributed where no suitable road material is procurable locally and where otherwise no such material would be used at all. The State also furnishes a steam roller and an engineer to direct the work of the local labor employed. Material sufficient for about 110 miles of road has been distributed to various localities, where the local authorities have made application to the State commission. The cost of transportation of this material promised to be a problem at one time, but the Interstate Commerce Commission has decided that for hauling material for public use under the direction of public authorities the railways may make special rates and need not post them in the way required for commercial rates. It is now proposed to establish other stone crushing plants (for convict labor) at places where they would not come into competition with free labor, thus facilitating the distribution and reducing the cost and delay of transportation.

Resolutions were passed in favor of petitioning the Illinois Legislature for the State-aid system; approving of the present use of convict labor in preparing road material; and urging the establishment of three more quarries or distributing points throughout the State.

Nebraska Cement Users' Association.

The Nebraska Cement Users' Association held its fourth convention at Lincoln, February 10 to 13. There were more than two hundred present and about thirty exhibitors, all of whom reported themselves satisfied with the results. Storms and snow blockades kept many away.

The program was carried out in full. Mr. Barbour in a lecture illustrated by stereopticon showed beautiful things made of concrete about the house and lawn, and for ornamentation of buildings, and followed on to uses of concrete in buildings, bridges and other reinforced and plain construction, illustrating the widespread use of the material.

Mr. Peter Palmer showed the opposing forces in the concrete industry; how brick and lumber men sometimes take unfair means to substitute their wares. He believes that concrete will stand on its own merits if given a fair chance to demonstrate them.

Mr. C. A. P. Turner illustrated and described reinforced concrete construction in bridges and buildings. The bridge work was particularly attractive to citizens of Nebraska, who have the problem before them.

Mr. Barber showed by the stereopticon the substantial work done in ancient Rome and how it was done.

Mr. Wite discussed the subject of cracks from the practical standpoint.

Mr. Cone gave an instructive talk on bridge and culvert construction and showed the saving of time by using concrete.

Mr. Boynton discussed the necessities of good work, such as clean aggregates, thorough understanding of the work and proper care of it.

The election resulted in the re-election of L. E. Porter, York, as president, and of H. C. McCord, Columbus, and H. V. Grantham, Lexington, as vice-presidents, and Peter Palmer, Oakland, as secretary and treasurer, with C. A. Overstreet, Clay Center, and G. F. Lillie, Tekamah, as directors for one year, and Frank Berger, Hastings, J. M. Krieger, Rising City, and H. R. Park, Bruning, as directors for two years. We are indebted to I. E. Watenpaugh of Western, the efficient secretary this year, for our report of the meeting.

Museum of Safety and Sanitation.

Announcement has just been made of the acceptance of the treasurership of the Museum of Safety and Sanitation by Frank A. Vanderlip. An executive office for the administrative and promotive work of the museum has been opened at the United Engineering Societies' Building, 29 West Thirty-ninth street, New York.

A committee on plan and scope includes Prof. F. R. Hutton, chairman; Dr. Thos. Darlington, commissioner of the Health Department of the city of New York; P. T. Dodge, president of the Engineers' Club; Wm. J. Moran, attorney-at-law, and Henry D. Whitfield, architect.

Plans are being pushed forward along practical lines to prevent the enormous loss of life and limb to American life and labor, through the Museum of Safety and Sanitation, where safety devices for dangerous machines and preventable methods of combatting dread diseases may be demonstrated. Charles Kirchhoff is the chairman of the Committee of Direction; T. C. Martin, vice-chairman, and Dr. William H. Tolman, director.

The National Association of Cement Users.

The echoes from the defects in management of the Cleveland convention and exhibit of the National Association of Cement Users are even stronger than heretofore. They demonstrate the point which MUNICIPAL ENGINEERING has made with respect to the last three conventions, namely, that the manager of the organization is still attempting to perform the impossible task of forcing into a convention which he is making each year more thoroughly technical the many who come to see the exhibits and have no interest in the deliberations of the convention. Arbitrary rules enforced with insufficient notice will not produce the desired result, but will only irritate both

exhibitors and patrons. There seems to have been some additional irritation over the attempt to suppress announcements of the Chicago show. Until the undoubted fact above stated is recognized and convention and show are allowed to pursue their different lines without interference the friction observed each year will continue. Independence of commercial influences such as those described can only be obtained by a practical separation of the two lines, retaining only the common time and place of meeting and a co-operative spirit such as may well be given opportunity to express itself through representation of both on the board of trustees. The apparent inability of the manager to see the reasons for the difficulty, and his arbitrary actions in attempting to force the impossible, suggest the possible necessity of a change. This ought to be made, however, in such a way as to retain his services in the convention, in the conduct of which he has shown marked ability. The original idea of the society, which provided a president fitted for the conduct of the convention and a manager to look after the business end of the combination showed some evidences of success in the brief period before the two functions were assumed by one officer, enough to warrant a more thorough trial.

Technical Meetings.

The fifth annual convention of the Northwestern Cement Products Association will be held at Minneapolis, Minn., March 2, 3 and 4, at the Minneapolis Armory. J. C. Van Doorn, secretary.

The twenty-fifth meeting of the Connecticut Society of Civil Engineers was held at Hartford, Conn., February 9 and 10. The society voted that the Connecticut delegation in the Federal Congress be urged to advocate the passage of the bill for the construction of a 11,000-ton testing machine. "Reinforced Concrete in the Connecticut State Armory" was the subject of a paper by B. W. Morris; "Concrete Sewers," by Henry J. Kellogg, of New Haven, described the State street overflow sewer recently completed in New Haven; "Tunnel and Concrete Sewer at Hartford," by R. N. Clark, of Hartford; "Costs of Sewer Work," by J. F. Jackson, of New Haven; "Reinforced Concrete Round House," by G. M. Poley, of Waterbury; "The Engineer in Court," by E. W. Bush; "Conservation in the Use of Wood," by McGarvie Cline; "Stray Thoughts on Bridge Design and Maintenance," by Herbert C. Keith, of New York City, and other subjects of papers.

The members of the Interstate Cement Tile Manufacturers' Association, who will meet in conjunction with the Northwestern Cement Products Association in Minneapolis, Minn., March 2, are located in eight States, and the association is growing rapidly, as manufacturers of cement drain tile are joining the association to aid in the important work it now has under way. The present membership represents an invested capital well over a million dollars, and the work of the association will continue to increase in importance, as the manufacture of cement drain tile is comparatively new and is growing very rapidly, numerous plants in many States being now under construction.

The twenty-fourth annual convention of the Illinois Society of Engineers and Surveyors was held at Chicago January 27, 28 and 29. Dr. W. A. Evans, commissioner of health, discussed the value of the Chicago drainage canal in reducing the typhoid death rate in Chicago from 175 per 100,000 in 1891 to 15 in 1908. While other causes than water supply may be responsible for the transmission of typhoid fever, he considers that it can be considered largely the source of such trouble when the death rate exceeds 25 per 100,000. Chicago's rate has been, for some years, below this number. Dr. Evans pointed out, at the same time, that during the last year colon bacilli have been found in the water supply of the city to an unusual degree. While the situation at present is not such as to warrant alarm, he feels there is a potential danger of the possibility of an epidemic of typhoid fever in Chicago at some future time. Other papers submitted treated of roads and pavements, the expansion of pavements, particularly those of creosoted wooden blocks, and highway bridges. John B. Hittle, manager of the Board of Local Improvements of Chicago, was elected president of the society for a two-year term; E. E. R. Tratman was re-elected secretary. The next annual meeting of the society will be held at Cairo, Ill.

The second annual meeting of the Illinois Association of Municipal Contractors, organized a year ago, was held at Springfield, Ill., February 11.

The Association of County Engineers of New Jersey met at Camden, N. J., January 28, to discuss methods of road building to meet the demands of automobile travel. A feature of the meeting was a visit to three roads built in that vicinity during the last season. These visits were made in cars furnished by the Motor Club of Camden. One highway is an Imperial road at Westcotville; one is a macadam road built with an asphalt soil binder; and one is an Amiesite pavement at Magnolia, the first of its kind built, and has a surface of crushed stone treated at the quarry with a coating of asphalt oil and lime. While all of the roads visited were in good condition, the last, in particular, received favorable comment.

The annual meeting of the New England Gas Association was held at Boston, Mass., February 17 and 18. N. W. Gifford, East Brocton Gas Company, East Brocton, Mass., secretary.

At a meeting of the Western Society of Engineers held in Chicago February 3, Horace E. Horton read a paper on "Water Storage in Elevated Tanks and Standpipes."

At a regular meeting of the Engineers' Club of Baltimore February 6, Wm. D. Janney, M. Am. Soc. C. E., read a paper on "Engineering Work in Costa Rica."

The first convention of the Canadian Cement and Concrete Association will be held at Toronto, Ontario, March 1 to 6. The exhibition will include products from the different manufacturers of cement, and from manufacturers of machinery, appliances and kindred articles.

The Minneapolis Engineers' Club held its annual meeting February 1. W. P. Cowles submitted the leading paper of the evening, treating of reinforced concrete. Officers for the year were elected as follows: President, W. P. Cowles; vice-president, Edwin H. Brown; secretary, Benjamin Waller; treasurer, B. H. Stahr; librarian, W. W. Redfield; finance committee, E. K. Burch and William R. Hoag.

The fifth annual convention of the Iowa cement users was held at Des Moines, Iowa, beginning February 2. Addresses were made by A. B. Elliott on "Steam Curing of Cement Products"; "The Education of an Inspector at the Contractor's Expense," by James Forrest; "Locust Street Concrete Bridge," by J. W. Burrows. Officers for the ensuing year were elected as folows: President, George H. Carlon, Oskaloosa; vice-president, J. L. Budd, Des Moines; second vice-president, C. B. Roman, Camanche; treasurer, Geo. R. Ross, Grinnell; secretary, Ira A. Williams, Ames.

Permanent offices have been established by the Ohio Association of Contractors in the new First National Bank Building, Columbus, Ohio. They will be in charge of Arthur J. Thatcher, Columbus, the secretary-treasurer of the association. The president is Oliver R. Rieley, Cleveland; the vice-president is William M. Graham, Columbus, Ohio. The association was formed one year ago, and its first annual meeting, held February 9, in Columbus, was unusually well attended. To improve conditions under which members labor; to promote good roads and streets; to secure proper performance of public contracts, and promote good fellowship among its members are the benefits sought by the association.

The Oklahoma cement users held their first convention in Machinery Hall at the State Fair grounds, Oklahoma City, Feb. 9, 10 and 11.

At the meeting of the New York Electrical Society, February 17, Dr. Louis Bell lectured on modern practice in street lighting.

At the meeting of the Brooklyn Engineers' Club, held February 11, Nelson P. Lewis made some observations on the organization and methods adopted for highway work in France and other European countries, gathered during his trip to the International Road Congress in Paris.

At the meeting of the New England Water Works Association, February 10, A. A. Knudson, electrical engineer, discussed lead-covered cables as a cause of electrolysis upon water pipes, and Frank E. Merrill, water commissioner of Somerville, gave the results of grounding electric light wires on water pipes.

The National Municipal League has paid much attention to the subjects of municipal accounting, reports and statistics and uniformity therein and some forty addresses on the subjects by experts in the various lines will be found in the annual volumes of transactions.

The Civil Engineers' Society of St. Paul, Minn., is a member of the Association of Engineering Societies and its proceedings are published in the monthly journal of that association. Meetings are held in the club room in the City Hall on the second Monday of each month except the three summer months. The current engineering publications are kept on file in the office of the librarian in the City Hall and are open to all. The society has about 70 members. H. J. Bernier is president, D. F. Juergensen is secretary, and Watson Townsend is librarian.

Engineers Who Want Positions.

The U. S. Department of Agriculture is completing its investigations of the drainage of the St. Francis basin in Arkansas, and has employed a temporary force of about thirty-five instrumentmen, rodmen, axemen and cooks who will soon be out of employment. Most of the instrumentmen are college graduates and half of them are competent chiefs of parties. Salaries received are from $75 a month for the latter to $40 for the axemen, with expenses. Arthur E. Morgan, the supervising engineer, Jonesboro, Ark., will give further details.

Civil Service Examinations.

The U. S. Civil Service Commission will hold examinations at the usual places as follows:

March 10, 11: Civil engineer in the Philippine Service at $1,400 and higher salaries.

Civil Service Exemptions Under New York Highway Commission.

The State Civil Service Commission, on February 10, exempted from competitive examinations the positions of first and second deputies and the secretary to the new State Highway Commission of New York. These positions, each of which pays an annual salary of $3,500, will be filled after the Governor has sent another nomination to the Senate for the minority member of the commission, provided the nomination is confirmed, which will permit the commission to organize.

Personal Notes.

Fred R. Charnock has been reappointed city engineer at Medford, Mass.

West Bissell has opened an office as gas engineer at 25 Zabriskie street, Jersey City, N. J.

Clarence J. Stetson, chief engineer of the water works at Pueblo, Colo., died suddenly during the first week of February.

Howard J. Cole, C. E., has been appointed street commissioner at Morristown, N. J. Mr. Cole's offices are in New York City.

Hon. Hugh Lyons, ex-mayor of Lansing, Mich., died in that city February 4, after an illness of several months, aged 51 years.

Smith Edward Lane, commissioner of parks of New York City from 1878 to 1883, died February 1 in New York City, aged 80 years.

Hon. Samuel W. Lane, mayor of Augusta, Me., for four years, 1889, 1890, 1899 and 1900, died in that city February 6, aged 70 years.

James L. Tighe, M. Am. Soc. C. E., city engineer of Holyoke, Mass., has been elected a member of the Institution of Civil Engineers.

John Gilmer Speed, author and journalist, committed suicide recently. Mr. Speed was educated as a civil engineer and served as city engineer at one time at Louisville, Ky.

Hon. Benjamin F. Funk, former mayor of Bloomington, Ill., died in that city February 14, aged 71 years. He was prominent in municipal affairs from the time he became a resident of the city in 1867. He was called the "father of city water works."

W. E. Smith has resigned as city engineer of Webb City, Mo., to become general manager of the Engineering Construction Company of Kansas City. Mr. Smith will have charge of work for the company at Purcell, Okla., connected with sewer construction.

City engineers have been re-elected as follows: Pawtucket, R. I., George A. Carpenter; Middletown, Conn., R. M. Wilcox; Central Falls, R. I., William F. Keene; Watertown, N. Y., Earle Sayles; Northampton, Mass., M. D. Patteson.

Olaf Hoff has opened an office in the Singer Building, 149 Broadway, New York, and will pay special attention to the designing of bridges, foundations, subaqueous tunnels, subways and other structures in steel, stone and wood.

MACHINERY AND TRADE

Ten Million Pound Testing Machine.

There is being constructed for the Structural Materials Testing Laboratories, U. S. Geological Survey, by Tinius Olsen & Co., Philadelphia, Pa., a vertical compression testing machine of 10,000,000 pounds capacity. This machine, having a gross weight of over 200 tons and an extreme height above foundation of about 80 feet, is the largest ever constructed.

The machine was primarily acquired to test large blocks of stone in the study of building stones and the effect of flaws and defects of the various kinds in large blocks. To care for a further request of the Supervising Architect for data on the strength of structural columns of brick and concrete and structural steel, the original clearance between heads was increased from 25 to 65 feet. There are urgent requests for early completion of the machine. The machine is capable of testing built-up structures of even greater size than the chords of the Quebec and Blackwell's Island bridges.

It is a large hydraulic press, with one adjustable head, and a weighing system for recording the loads developed in it by means of the triple plunger pump. It has a maximum clearance between heads of 65 feet; the clearance between the screws is a trifle over 6 feet, and the heads are 6 feet square.

The machine consists of a base containing the main cylinder with a sectional area of 2,000 square inches, upon which rests the lower platform or head, which is provided with a ball and socket bearing. The upper head is adjustable over four vertical screws 13½ inches in diameter and 72 feet 2 inches long, by means of gearing operating four nuts with ball bearings upon which the head rests. The shafting operating this mechanism is connected with a variable speed motor, which operates the triple plunger pump which supplies the pressure to the main cylinder.

The weighing device consists of a set of standard Olsen levers upon which is weighed one-eightieth of the total load on the main cylinder. This reduction is effected through the medium of a piston and diaphragm. The main cylinder has a diameter of 50 inches, and the smaller a diameter of 5 9-16 inches. The weighing beam is balanced by an automatically operated poise weight and is provided with a device for applying successive counter weights of 1,000,000 pounds each. Each division on the dial is equivalent to a 100-pound load; the smaller sub-divisions are possible by means of an additional needle beam.

The power is applied by means of a 15-h. p. 220-volt variable-speed motor operating a triple plunger pump. The gearing operating the upper head is driven by the same motor.

The extreme length of the main screws necessitates splicing, which is accomplished as follows: In the center of the screws at the splice is a 3-inch threaded pin for the purpose of centering the upper and lower screws; this splice is strengthened by means of split sleeve nuts, which facilitates the removal of the sleeve nuts whenever it is necessary to lower the upper head; after the head has passed the splice the sleeve nuts are replaced.

In order to maintain a constant load a needle valve has been provided which will allow, when the pump is operated at its lowest speed, a sufficient quantity of the oil to flow into the main cylinder to equalize whatever leakage there may be. The main cylinder has a vertical movement of 24 inches.

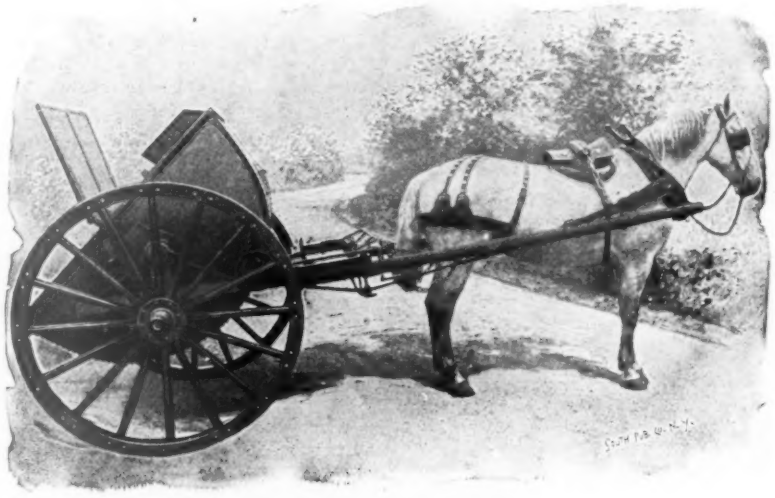
The speed of the machine for purpose of adjustment, using the gearing attached to the upper head, is 10 inches per minute. The speed for applying loads, controlled by the variable-speed motor driving the pump, varies from the minimum of at least one-sixtieth of an inch per minute to a maximum of at least one-half inch per minute.

The contract provides that the machine shall have an accuracy of at least one-third of 1 per cent for any load over 100,000 pounds up to the capacity of the machine.

Some idea of the size of the machine may be obtained from a statement of the weight of its principal parts. The castings for the base and the top head weigh approximately 50,000 pounds each. Each main screw will weigh over 40,000 pounds. The lower platform weighs about 25,000 pounds and the main cylinder 16,000 pounds. The top of the machine will be about 70 feet above the top of the floor, and the concrete foundation upon which the machine rests will be about 8 feet below the floor line.

A Steel Sanitary Cart.

The accompanying photograph shows a steel cart for garbage, night soil, ashes, etc., which has been in successful use for several years and has had commendatory notice from all who have used it. The sanitary form without corners and readily cleaned is evident from the picture,



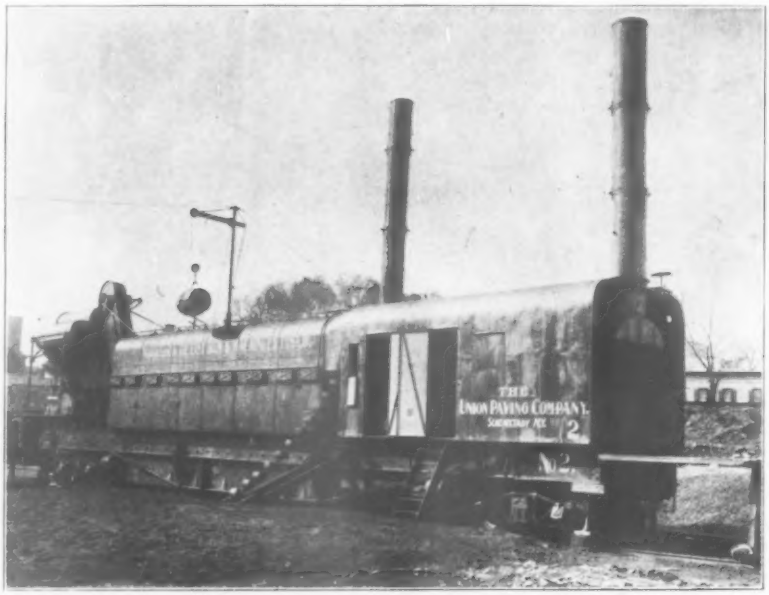
HOLZBOG SANITARY CART.

which shows the cart body in an intermediate position. It can take and be locked in any position from one with the cover level to one almost inverted, so that nothing can remain in the body.

The lids are close fitting with deep flanges and can be locked shut. The rear lid can be locked open in several positions, one of which is shown in the picture. Even when the top of the cart is level it is only 4 feet and 3 or 4 inches above the ground, so that in any position it is easy for the shoveler to reach. This cart is now manufactured by Geo. H. Holzbog & Bro., 136 East Chestnut street, Jeffersonville, Ind., who will give any desired information about uses of the cart, sizes, prices, shipments, etc. The firm also makes the standard U. S. ambulances and litters.

A Railroad Asphalt Plant.

The Merriman one-car asphalt plant seems to meet the demands of the asphalt paving contractors for a portable plant of reasonable capacity, and the proof of this is their purchases of the plants. The cost of getting the plant ready for work is low, for it is set up ready for business in five hours after arrival on the ground, while when made ready for shipment it is all loaded on one car. It will turn out 1,800 square yards of sheet asphalt pavement in a day. The accompanying photograph shows the plant set up ready for operation, with a barrel of asphalt on the hoist ready to dump into the kettle.



MERRIMAN ONE-CAR ASPHALT PAVING PLANT.

New Pipe Foundry.

The Lynchburg Foundry Co., 220 Broadway, New York, operating the McWane and Radford pipe works, have purchased a large tract of land near Norfolk, Va., on which they will build another pipe foundry this year. This new location is on tidewater, with belt line railway connections, and affords every facility for better service and a cheaper product.

The details of the new plant will be worked out on the return of two of the McWane brothers from a visit to pipe foundries in England and other countries, to learn, if possible, of any superior methods of making pipe abroad, and to confirm or refute the statement made recently in a letter from an English engineer that "so far ahead of American pipe makers are the British that 90 per cent of the pipe that passes inspection in this country would be broken up in England." Many of the firm's customers have said that they were making a good quality of pipe, but if better can be made they will find it out.

The erection of this plant will not affect the output of the other shops, but all will be operated to their fullest capacity.

Bridge Construction in Prospect.

A contractor who has made a careful survey of the field through his local representatives reports to MUNICIPAL ENGINEERING that bridges will be built this year in Ohio to the amount of $1,000,000; in Iowa $500,000; in California $500,000; in Illinois $100,000; and in Indiana $25,000.

The Chicago Quick Dumper is Adaptable.

To charge a mixer with 3 cubic yards of sand and gravel in thirty seconds seems to be almost impossible. In fact, it would probably be impossible in any other than the novel and interesting manner in which it is done by Messrs. Bates and Rogers, who are contractors for a part of the new $20,000,000 depot which is being built by the Chicago & Northwestern Railway at Chicago. The accompanying pictures show the manner in which this feat is accomplished. The wagons for hauling are all equipped with Chicago Quick Dump Boxes, which set free on the gear. The load is driven up to the hop-

CHICAGO QUICK DUMPING WAGON BED.

Ready to Lift.

CHICAGO QUICK DUMPING WAGON BED.

Empty Wagon Returning to Running Gear.

per and a bridle, attached to a derrick, is hooked on to the dump box and the latter is very conveniently lifted up to the hopper and dumped and again lowered to the gear and then driven off. This can all be accomplished in less than one minute and the team is not idle longer than that time.

This unique arrangement is made possible by the use of the movable dump box and the easy manner in which it is lifted and replaced. Twenty-five of the 3-yard boxes are used on this work and are furnished by the Black Mfg. Co., 126 East Ohio street, Chicago.

The makers claim as one of the important advantages of the Chicago quick dumper that there is a reduction of 25 to 50 per cent in the draft of a wagon equipped with it. This is possible because the mechanism operating the bottom dump shutters is such that the wagon gear can be closely coupled, bringing the front and rear wheels close together and the weight of the load is equally distributed over the two axles. For the purpose illustrated in the photographs, this is a strong point, but it is equally strong for dumping with the bed set on the gear, for the dumping mechanism acts quite as readily and discharges the load, largely between the two axles, but also in front and behind. The increase in load carried of 25 to 50 per cent and the loss of no time in dumping make the Chicago quick dumper a most economical investment.

Municipal Asphalt Paving Plants Proposed for New York.

A bill introduced in the New York legislature February 11, by Assemblyman Hoey, provides for the erection and equipment of municipal asphalt plants in each of the boroughs of the city of New York. In his statement Mr. Hoey said:

The city of New York is at the present time absolutely at the mercy of the asphalt trust, and as a result is compelled to pay exorbitant prices for asphalt pavement. There is only one way to meet this situation, and that is for the city to erect and equip its own asphalt plants. It has been done in other cities with great success, and there is no reason why New York should longer subject itself to the exactions of unscrupulous combinations.

Washington Commissioners Prefer Regulation to Ownership of Public Utilities.

The Commissioners of the District of Columbia sent a letter to Congress recommending that before the municipal ownership plan proposed in the Jenkins bill is tried, a plan of public regulation be adopted. The Jenkins bill provides for the purchase by the District of Columbia of the public utilities within its boundaries. The District Commissioners reiterate the recommendation, made in their annual report, that the powers of a public service commission be conferred on them, and recommend the passage of a bill to that effect now before Congress. The letter of the Commissioners, in part, is as follows:

The Commissioners believe there is no place in the United States where the municipal operation of public utilities would have less difficulties than in the District of Columbia. This is chiefly because it is free from partisan politics. The successful operation of the water supply system illustrates what could be done.

But they believe that municipal ownership of public utilities ought not to be extended until it has been demonstrated that public regulation of public utility corporations has failed to produce as good results as might be expected from the public operation of public utilities. They do not believe that the time has come to remommend the municipal ownership of public utilities, other than the water supply in the District of Columbia, because they have not had a trial of suitable regulation of the public utility corporations by public authority.

It is for this reason that the Commissioners have recommended for the past two years to Congress that they should be clothed with the powers of a public service commission, with authority and means to employ experts as they might be needed, so as to effectively regulate the operation of the public service corporations of the District of Columbia, including street railway and telephone companies as well as the gas and electric light companies.

Trade Publications.

A pamphlet issued by the Independent Brickmakers' Association without date or place of publication is entitled "A Tale with a Moral" and describes some observed defects of certain concrete pavements.

J. Augustine Smith's paper on "The Present and Future of the Cement Block," which he read before the National Association of Cement Users, has been issued in a copyrighted pamphlet, which will doubtless be sent on request.

The Cowles and Clark method of protecting fire hydrants from freezing is detailed in a pamphlet issued by the Hydrant Protective System, 135 Broadway, New York City.

The A. L. Barber Asphalt Co., 90 West street, New York City, publishes in a neat pamphlet a paper by Mr. Barber on "The Best Road and the Right Way to Make It," which describes his idea of a combination of a strip of asphalt pavement 6 feet wide and two macadam strips each 6 feet wide for well-traveled country roads.

A well-printed circular shows two styles of 5-inch engineers' transits, dumpy and Y-levels made by the Bausch & Lomb Optical Co., of Rochester, N. Y.

Dubois gas engines and producer gas plants are handsomely shown in the catalog of the Dubois Iron Works, Dubois, Pa.

A new booklet issued by the Wm. G. Hartranft Co., Philadelphia, Pa., shows

views of culverts, abutments and piers on the Virginian railway in which Old Dominion Portland cement was used.

Bulletin No. 1 of the Chapman Valve Mfg. Co., Indian Orchard, illustrates and describes methods of operating water and gas valves by electricity.

The Lawrence Cement Company issued "An Appreciation of Lincoln and Washington" for distribution during their common birth-month, containing small portraits and the Gettysburg address of the one and the farewell address to the army of the other.

One of the publications of the Northwestern Expanded Metal Co., is a card containing a series of formulas for the computation of reinforced concrete beams.

The latest booklet of the Sandusky Portland Cement Co., Sandusky, O., gives "Many Every Day Uses, Suggestions and Applications" of and about cement and is a very convenient compendium of notes on practical points in the manipulation of cement and concrete.

Siemens & Halske, Hudson Terminal Building, New York, have a well-illustrated catalog of isolated plants for the sterilization of drinking water by means of ozone for private and public buildings and industrial establishments. Those shown will purify from 500 to 2,700 gallons an hour.

Trade Notes.

ASPHALT.

Cleveland, O.—Special.—The F. D. Cummer & Son Co. of Cleveland, O., advise us that they have just sold one of their large one-car portable asphalt paving plants to the American Asphaltum & Rubber Co.

CEMENT.

The Sandusky Portland Cement Co., of Sandusky, O., are supplying their white Portland cement for use in the following important contracts: In mausoleum construction at Decatur and El Paso, Ill.; on the Studebaker private residence, South Bend, Ind.; for setting and pointing Vermont marble, Columbia Theatre, St. Louis, Mo.; for exterior ornamental work on Tripp's Dancing Academy, St. Louis; exclusively on the Italian Gardens, Cheeseman Park, Denver, Colo.; for wainscoating in the new City Hospital, St. Louis, Mo.; Emigrant Savings Bank, New York City.

They are also furnishing their Medusa Waterproof Compound for the following important contracts: One hundred cement cisterns being constructed by the Board of Public Works, San Francisco, Cal.; in the roofs of the Southern Pacific Railway Company's hospital; to the Quartermaster's Department, U. S. A., Key West, Fla.; in the cement vaults for the Title Trust Co., Seattle, Wash.; exterior of plaster on the Perry apartments, Seattle, Wash.; in the Diamond Ice Company's plant, Seattle, Wash.

CONCRETE BLOCKS.

Springfield, O.—The Concrete Coating Co. has been incorporated by Ellsworth Craig, E. F. Davis, W. S. Lefevre, J. T. Ricks and J. F. Whiting.

Kirtland, O.—The Everett Stone Co. has been incorporated by C .H. Gale, R. T. Sawyer, G. S. Holden, C. M. Buss and W. T. Holiday.

Canton, O.—The Canton Cement Specialty Co. has been incorporated by M. Nelson, Fred W. Pederson, K. Johnson and L. E. Dauble.

Bertram, Ia.—A concrete block company is contemplated here. Address the mayor.

Cumberland, Wis.—L. M. Engesether contemplates establishing a plant for the manufacture of concrete blocks.

Waterville, Minn.—J. Walker Pope, of Minneapolis, and A. H. Fuller, of Fairmount, Minn., contemplate the erection of a cement tile plant here.

Chicago, Ill.—The Cropp Concrete Machinery Co., 140 S. Dearborn St., has been incorporated by Andrew J. and B. M. Cropp and A. J. Sherman, to manufacture machinery and supplies.

Lexington, Ky.—The Louis des Gognets Coal, Concrete and Feed Co. has been incorporated by Louis des Gognets, Mattie F. Bain and T. Young.

PURCHASE OF MACHINERY.

Yucca, N. D.—Special.—Frank J. V. Kiebert advises us that he is in the market for road machinery.

Oshawa, Ont., Can.—Special.—W. S. Bowden, Box 683, desires to purchase a steam road roller, stone crusher, cement mixer, sprinkling wagons and cement tools.

Milwaukee, Wis.—Special.—Teofil Synkalski, 632 Smith St., desires to purchase a sewer excavator.

Cedar Rapids, Ia.—Special.—J. D. Barker, 1050 10th Ave., E., is in the market for a mixer and sidewalk tools.

Little Rock, Ark.—Special.—F. W. Ward advises us that he desires to purchase a continuous mixer and a 25-h.p. oil engine.

Missoula, Mont. — Special. — John T. Harrington, 525 S. 4th St., desires to purchase one double-drum 2-cylinder steam hoist 6¼ by 10 inches.

Preston, Minn. — Special. — George H. Love advises us that he is in the market for graders, scrapers, plows and road tools.

Chicago, Ill.—Special.—Ernest O. Heinsdorf, Teutonic Bldg., 168-174 Washington St., advises us that he has an inquiry for Latin-American export for sprinkling cars to be drawn by two mules.

Buffalo, N. Y.—Special.—F. M. Nash, 1339 Michigan St., advises us that he is in the market for machinery and tools for paving, sewers, water works and railroads.

PURCHASE OF MATERIALS.

Cincinnati, O. — Special. — P. Farrell general contractor, 1010 Second National Bank Bldg., is in the market for 250,000 vitrified paving brick for use on the Missouri Pacific Railway in Louisiana, and desires to communicate with manufacturers.

Princeton, Ind.—Special.—L. S. Kell, 426 E. Water St., advises us that he is in the market for sand, gravel and cement during 1909.

Cedar Rapids, Ia.—Special.—J. D. Barker, 1050 10th Ave., E., is in the market for cement and reinforcement.

Milwaukee, Wis.—Special.—Teofil Synkalski, 632 Smith St., is in the market for sewer pipe and concrete reinforcement.

Potsdam, N. Y.—Special. F. E. Timmerman desires to purchase a road roller.

LIGHT, HEAT AND POWER.

Lancaster, O.—The McLinney Gas & Oil Co. has been incorporated by G. W. Moss, Samuel F. McCracken, Isaiah

Driver, H. F. Teal and W. A. Thompson.

New Lexington, O.—The Monarch Oil & Gas Co. has been incorporated by John T. Pyle, Charles C. Chappelear, H. C. Lucas, R. L. McDonald and R. J. McGonagle.

Newcomerstown, O.—The Low Gap Oil & Gas Co. has been incorporated by Alex Redick, W. H. Herbert, Elmer Turner, B. W. Van Sickel and Albert Smith.

Hamilton, O.—The Butler Electric Equipment Co. has been incorporated by Paul M. Hooven, G. G. Schoneberger, Bert Seevers, Vincent J. Bramlage and A. P. Darrow.

MISCELLANEOUS.

Denver, Colo. — Special. — Surveys are being made for the first division of the electric trolley line of the Denver, Colorado Springs & Pueblo Interurban Electric Co. The first division will extend from Denver to Colorado Springs, a distance of 74 miles, and when it is completed the second division, from Colorado Springs to Pueblo, 45 miles, will be constructed. Interested in the project are M. Pfeiffer, of Denver; Wm. T. Brinford, of Salt Lake City; Chas. Lederer, of Chicago; Fred C. Lewis, of Chicago; Arthur E. Van Deusen, of Denver.

Robert W. Hunt & Co., consulting and inspecting engineers, have engaged the services of Mr. John Cargill, who will make his headquarters at the firm's New York office, 90 West street. He will largely devote his attention to the examination and report upon railway and other corporate properties, for which his experience, gained while connected with the Pennsylvania Lines, British Westinghouse, Metropolitan Railway Company of London, and other organizations, has prepared him.

IMPROVEMENT AND CONTRACTING NEWS

PAVING.

Trenton, N. J.—A bill has been passed in the legislature authorizing freeholders to issue bonds not exceeding $30,000 to construct tunnels for public streets or roads under railroads, and natural or artificial streams or waters.

Trenton, N. J.—The legislature has passed a bill authorizing the Interstate Palisade Park Commissioner to construct a road with suitable approaches to be known as the Hendrik Hudson drive on top of the palisade, in commemoration of the tercentenary of the discovery of the Hudson River.

CONTEMPLATED WORK.

Bayonne, N. J.—Paving is contemplated for Broadway.

Albert Lea, Minn.—Paving is contemplated for Broadway.

La Crosse, Wis.—Paving is contemplated for Clinton st.

Sanford, Fla.—Brick paving is contemplated for First st.

Marengo, Ia.—Paving is contemplated for the Public Square.

Cresco, Ia.—Curbing is contemplated for several streets.

Boone, Ia.—Brick paving is contemplated for several streets.

Moorhead, Minn.—Council has decided to use tamarack blocks for paving.

Bedford, Ia.—Brick paving is proposed for Main and adjoining streets.

Duluth, Minn.—Paving is contemplated for Sixth st. from Wallace to Woodland.

Des Moines, Ia.—Council has passed resolutions for paving aggregating $100,000.

Culpeper, Va.—The construction of about 10 miles of macadam roads is contemplated.

Sparta, Wis.—The question of paving several streets is again under consideration.

Orlando, Fla.—Vitrified brick paving is contemplated for W. Pine st. and Central ave.

Bremerton, Wash.—Council is considering a petition for paving the business streets.

Newburg, N. Y.—A hearing will be held March 2 on the proposed improvement of S. Water st.

Oconomowoc, Wis.—Vitrified brick or creosoted wood block paving is contemplated for Main st.

Albany, Ga.—Broad st., a principal business street, will be paved with vitrified brick.

Springfield, O.—Paving is contemplated for Mulberry st. and College and McCreight aves.

Trenton, N. J.—Plans are being prepared for constructing 18 miles of stone roads in Mercer co.

Bessemer, Ala.—Ordinances have been passed providing for paving in 18th st. Mayor Rush.

Columbus, O.—Paving is contemplated for Indiana, Jefferson, Seibert, Stauring and other streets.

Aberdeen, Wash.—City council has passed a resolution for the paving of Market and K sts.

Springfield, Ill.—Ordinances have been passed for paving 8th, College and 3rd sts. and Fayette ave.

Cincinnati, O.—The city engineer estimates the cost of paving Edgewood ave. with brick at $10,525.

Washington, D. C.—A number of citi-

zens have petitioned for modern paving in Union st. between N and O sts.

Frazee, Minn.—This village will vote on the question of constructing cement crosswalks, curbs and gutters.

Albany, N. Y.—Paving is contemplated for the roadway between Eagle and Swan sts. Walter Melius, cy. engr.

Atchison, Kan.—A resolution has been passed providing for brick paving in 11th st. Chas. A. Hawk, cy. clk.

Gloversville, N. Y.—About 17,000 sq. yds. of brick paving is contemplated in S. Main st. John F. Campbell, cy. engr.

Baltimore, Md.—New specifications have been approved for sheet asphalt repairs during the year 1909. B. T. Fendall, cy. engr.

Roselle Park, N. J.—The borough council has authorized Engineer Higgins to prepare plans for improving Walnut st. Mayor Ebert.

Williamsport, Pa.—About 20,000 sq. yds. of asphalt resurfacing is contemplated. Jas. F. Fisher, cy. engr.

Crookston, Minn.—The city clerk will ask for bids for cement sidewalk and crossing work during the season.

Watervliet, N. Y.—The question of repaving Broadway in the business section of this city is being agitated. Mayor Henrutta.

Everett, Mass.—Estimates are being prepared for constructing permanent pavement of different materials. Chris Harrison, cy. engr.

Tacoma, Wash.—The streets and alleys committee of city council has recommended the paving of S. 13th, S. 12th and S. Sprague sts. in the West End.

Crawfordsville, Ind.—Resolutions have been passed providing for the construction of brick paving in Walnut and Water sts. Henry B. Hulett, cy. clk.

Columbus, Ga.—The city council has authorized the macadamizing of 3rd ave. and has adopted an ordinance for grading and curbing Cemetery st. and 10th ave.

Newark, N. J.—Ordinances have been passed for paving a number of streets with brick, bitulithic, granite block and asphalt. Wm. E. Wreathead, clk. bd. of wks.

Indianapolis, Ind.—Plans have been ordered prepared for paving Hamilton ave. with brick and constructing stone curbing and cement walks in Barnes ave. and Dye st.

Lewiston, Idaho.—The city engineer has been authorized to prepare plans and specifications preparatory to asking for bids for constructing various kinds of hard surface pavements.

Sandusky, O.—The city council has under consideration the construction of about 28,000 sq. yds. of paving and 14,000 lin. ft. of curbing in Decatur, Jackson and Adams sts. C. M. King, cy. engr.

New Orleans, La.—Plans and specifications are being prepared for 118,000 sq. yds. of asphalt paving on concrete base in Carrollton ave. Asphalt paving is also contemplated for Charters st.

Portland, Wash.—The property owners on the west slope of Mt. Tabor, between E. 45th st. and West ave., and the Base Line road and Hawthorne ave., contemplate paving the streets with a hard surface pavement.

Eveleth, Minn.—This city contemplates constructing about 5 blocks of paving this summer. The material has not been decided upon, and contractors have been requested to submit prices on different materials. D. P. McIntyre, cy. clk.

Syracuse, N. Y.—Estimates have been submitted and bids will probably be asked soon for paving a number of streets with sandstone, creosoted wood block, asphalt, bitulithic, bituminous macadam, brick or macadam. Henry C. Allen, cy. engr.

Sioux City, Ia.—Paving is proposed for several railroad streets. Preliminary resolutions have been passed providing for 45,000 sq. yds. of brick block and 16,000 sq. yds. of asphalt paving. G. Y. Skeals, cy. engr.

Sioux Falls, S. D.—Council voted to construct cement sidewalks in Main ave.

CONTRACTS TO BE LET.

Cleveland, O.—Bids are asked until March 6 for improving Wooster road. A. B. Lea, co. surveyor.

Spencer, Ind.—Bids are asked until March 2 for constructing gravel roads. J. L. Ackerman, co. audt.

Vernon, Ind.—Bids are asked until March 1 for constructing one-half mile of pike road. T. L. Thomas, co. audt.

Logansport, Ind.—Bids are asked until March 2 for constructing a gravel road. Geo. W. Cann, co. audt.

Washington, Ind.—Bids are asked until March 2 for constructing 4 gravel roads. Thos. Nugent, co. audt.

Tipton, Ind.—Bids are asked until 10 a. m. March 1 for constructing 3 gravel roads. J. F. Barlow, co. audt.

Sullivan, Ind.—Bids are asked until March 2 for constructing 5 gravel roads. Ben C. Crowder, co. audt.

Vincennes, Ind.—Bids are asked until 2 p. m. March 2 for constructing gravel roads. John T. Scott, co. audt.

Columbus, Ind.—Bids are asked until 10 a. m. March 1 for constructing macadam roads. John M. Davis, co. audt.

Anderson, Ind.—Bids are asked until March 10 for constructing gravel roads. T. W. Richards, co. audt.

Decatur, Ind.—Bids are asked until March 1 for constructing 3 gravel roads. H. S. Michaud, co. audt.

Bloomington, Ind.—Bids are asked until March 3 for constructing 2 pike roads. Horace Blakely, co. audt.

Crown Point, Ind.—Bids are asked until March 1 for constructing a gravel road. Chas. A. Johnson, co. audt.

Cleveland, O.—Bids are asked until March 13 for constructing several roads. Wm. F. Black, clk. co. comrs.

Williamsport, Ind.—Sealed bids are asked until March 6 for constructing gravel roads. R. L. Winks, co. audt.

Crawfordsville, Ind.—Bids are asked until March 2 for constructing 2 gravel roads. B. B. Engle, co. audt.

Iowa City, Ia.—Bids are asked until March 15 for constructing township road work. Harry Welder, clk. Graham twp.

Greenfield, Ind.—Bids are asked until March 1 for constructing 2 macadamized roads. Chas. H. Troy, co. audt.

Bloomfield, Ind.—Bids are asked until 2 p. m. March 2 for gravel and macadamized roads. Peter M. Cook, co. audt.

Liberty, Ind.—Bids are asked until 2 p. m. March 1 for constructing a gravel road. Clinton Gardner, co. audt.

Danville, Ind.—Bids are asked until 10 a. m. March 1 for constructing 3 gravel roads. Wm. H. Nichols, co. audt.

Marion, Ind.—Bids are asked until March 6 for constructing a stone road 12,292 ft. in length. A. Y. Stout, co. audt.

Brownstown, Ind.—Bids are asked until March 3 for constructing a gravel road in Vernon twp. H. W. Wacker, co. audt.

Muncie, Ind.—Bids are asked until March 3 for constructing a gravel road in Delaware twp. Joseph E. Davis, co. audt.

New Castle, Ind.—Bids are asked until March 5 for constructing a gravel road in Fall Creek twp. W. L. Risk, co. audt.

Pauls Valley, Okla.—Bids are asked

until March 15 for constructing 17,986 sq. yds. of brick paving. L. C. Hunter, cy. engr.

Wabash, Ind.—Sealed bids are asked until 1:30 p. m. March 2 for constructing 3 miles of gravel road. J. P. Noftzger, co. audt.

Vevay, Ind.—Bids are asked until 1 p. m. March 1 for constructing a free gravel road in York twp. Scott Culbertson, co. audt.

Cleveland, O.—Bids are asked until March 20 for grading, draining and improving Northfield road. Wm. F. Black, chmn. comrs.

Harrisburg, La.—Bids are asked until April 5 for constructing 4 1-2 miles of road near Trinity. J. A. Guss, Jonesville.

Columbus, O.—Bids are asked until March 9 for macadamizing the Gahenna cemetery improvement in Mifflin twp. F. M. Sayre, co. audt.

Lafayette, Ind.—Bids are asked until 10 a. m. March 1 for constructing a gravel road in Lauramee twp. John P. Foresman, co. audt.

Tama, Ia.—Sealed bids are asked until March 15 for paving certain streets and alleys with brick on concrete, concrete curb, etc. H. F. Carmichael, cy. clk.

Marion, Ind.—Bids are asked until March 6 for constructing a brick and stone street 3119 ft. in length in the town of Upland. A. Y. Stout, co. audt.

Kentland, Ind.—Bids are asked until March 2 for constructing a north, south, east and west system of macadam stone roads. Elmer R. Bringham, co. audt.

National Soldiers' Home, Va.—Bids are asked until March 12 for constructing 3465 sq. yds. of concrete sidewalks. John T. Hume, treas. Southern Branch N. H. D. V. S.

Brooklyn, N. Y.—Bids are asked until March 3 for repaving several streets with asphalt on concrete, with concrete curbing, cement sidewalks, etc. Bird S. Coler, pres. boro.

Buffalo, N. Y.—Sealed bids are asked until March 3 for repaving Richmond ave. with macadam, dressed block stone, brick or asphalt on concrete. George H. Selkirk, sec. park comrs.

Louisville, Ky.—Bids are asked until March 2 for constructing 33 blocks of asphalt streets, including 23,200 sq. yds. of excavation, 14,000 ft. of curb, 55,800 sq. yds. of asphalt paving. John Chambers, ch. engr. B. P. W.

Corning, N. Y.—Sealed bids are asked until 7:30 p. m. March 4 for constructing one-fourth mile, 3,600 sq. yds., of brick paving with cement curbs and gutters, one-fourth mile, 4,300 sq. yds., of macadam paving with cement curbs and gutters. W. C. Sleight, clk. B. P. W.

CONTRACTS AWARDED.

Fowler, Ind.—The contract for macadamizing Fowler st. was awarded to Frank E. Cones for $31,641.

Olympia, Wash.—The contract for constructing 6500 sq. yds. of brick paving was awarded to W. A. Weller for $19,893.

Birmingham, Ala.—The contract for paving 26th st. with granitoid block was awarded to the Blome Paving Co., of Chicago, Ill.

South Omaha, Neb.—The contract for grading, curbing and paving W. L st. was awarded to the National Construction Co. for $33,713.

Tacoma, Wash.—The Independent Asphalt Paving Co. was awarded the contract for paving Alder, Center and S. 27th sts. for $89,116.

Springfield, Ill.—The contract for paving Pasfield and 8th sts. with brick was awarded to H. G. Welch at $1.46 a sq. yd.

Hamlin, Tex.—This city has increased the contract with the Cement Sidewalk Co. for paving Union ave. from 3000 to 5000 ft.

Cleveland, O.—The contract for paving 6 miles of Columbia road with brick was awarded to E. A. Freshwater & Sons, of East Liverpool, O.

St. Paul, Minn.—The contract for constructing sidewalks during the current year was awarded to the Portland Stone Co., Feb. 9, for $83,325.

Syracuse, N. Y.—The contract for 27,700 sq. yds. of asphalt repairs was awarded to the Warner Quinlan Asphalt Co., 438 S. Salina st., for $10,040.

Atlantic City, N. J.—The contract for paving New Hampshire ave. and other streets was awarded, Feb. 8, to the H. G. Mulock Co. for $50,220.

Greensburg, Pa.—The contract for paving 4 1-2 miles of road with brick was awarded to R. D. Hunter and J. N. Hammond, of Beaver, Pa., for about $80,000.

Huntsville, Ala.—The contract for paving a number of streets with asphalt was awarded to the Mineral Rubber Paving Co., of Memphis, Tenn., for $39,000.

Toledo, O.—The contract for paving Robinwood and Collinwood aves. was awarded, Feb. 9, to the Andrews Asphalt Paving Co., of Hamilton, O., for $16,974.

Shenandoah, Ia.—Paving contracts were awarded, Feb. 4, for paving with creosoted wood blocks, to the Kettle River Quarries Co., of Minneapolis, at $2.65 a sq. yd.

Marion, Ind.—Paving contracts have been awarded as follows: Sycamore st., Culver st., William Yates, $16,000; Mill st., Marion block, F. M. Benner, city, $8,000.

New Albany, Ind.—The contract for paving a number of streets with brick was awarded to the Jefferson County Construction Co., Feb. 6, at prices ranging from $4.04 to $4.50 a sq. yd.

Moorhead, Minn.—The contract for constructing 23,00 sq. yds. of paving was awarded, Feb. 1, to James Kennedy, of Fargo, N. D., at $2.52 a sq. yd. for brick paving and $2.59 a sq. yd. for creosoted wood block paving.

Brooklyn, N. Y.—The contract for constructing 12,000 sq. yds. of asphalt paving in Prospect pl. was awarded to the Cranford Co., 190 Montague st., at $1.07, and 18,000 cu. yds. of concrete at $5.75; total, $24,153; 5-year contract.

Seattle, Wash.—Contracts for street improvements have been awarded as follows: Concrete sidewalks in Bagley ave. and other streets, Joe Frank, 602 Bellevue st., N., $17,042; grading Olga and other streets, Agassiz & Hadley, $19,438; planking 17th ave. and other streets, A. K. Dye, $8,657.

Indianapolis, Ind.—Contracts have been awarded as follows: Constructing cement sidewalks in Lawrence and Boyd aves., Wm. M. Holl, $1.01 and $1.09 a lin. ft. respectively; cement walk and curb in Rural st., Henry Maag, $1.19 a lin. ft.; brick roadway in Bates st., Lakey Bros., $2.62 a lin. ft.; grading and graveling, cement walks, etc., A. D. Bowen, $2.33.

Youngstown, O.—Bids were submitted Feb. 13 for constructing turnpikes as follows: Kennedy Bros., on sandstone base, $12,401; Waldeck & Ready, on limestone base, $13.50; and L. H. Young, on slag base, $13,100.

St. Louis, Mo.—Contracts for street improvements were awarded, Feb. 3, as follows: Burd ave., between Minerva ave. and Eastern ave., asphalt, the Parker Washington Co., $13,446; Maryville ave., between the United Rys. Co. right-of-way

and Maple ave., asphalt, same, $4,951; Michigan ave., between Miami st. and Cherokee st., asphalt, Trinidad Asphalt Mfg. Co., $15,355; Garfield ave., between Clara ave. and Goodfellow ave., bitulithic, Granite Bituminous Paving Co., $13,078; Lucretia ave., between Minerva ave. and Wells ave., bitulithic, same, $13,152; Rutger st., between Newstead ave. and Taylor ave., same, $7,556; McDonald ave., between Grand ave. and Gustine ave., bitulithic, same, $21,031, and Smith st., between Wharf and Lewis sts., granite.

Philadelphia, Pa.—Bids for repaving Market st. were submitted, Feb. 15, as follows: Granite block throughout, Barber Asphalt Co., Land Title Bldg., $3.20, $3.26, $3.43, $3.59; Mack Paving Co., Land Title Bldg., $3.29, $3.35, $3.45, $3.58; William A. Ryan, 1219 Dickinson st., $3.60, $3.73, $3.80, $3.91; Cunningham Paving Co., $3.00, $3.30, $3.36, $3.91; Owen J. Evers, $3.52; Michael O'Rourke, $3.42, $3.64, $3.81, $3.96; Millard Construction Co., Pennsylvania Bldg., $3.19. Asphalt.—Granite block to Second st.: Barber Asphalt Co., asphalt $2.04, block $3.22, asphalt $3.24, block $3.28, asphalt $2.04, block $3.45, asphalt $2.04, block $3.61; Filbert Paving Co., asphalt $1.94, block $3.50. Wood — Granite block to Second st., Barber Asphalt Co., wood $3.16, block $3.22, wood $3.16, block $3.28; wood $3.16, block $3.45, wood $3.16, block $3.61, wood $3.32, block $3.22, wood $3.32, block $3.28, wood $3.32, block $3.45, wood $3.32, block $3.61; Cunningham Paving Co., wood $3.72, block $3.00, wood $3.72, block $3.72, wood $3.72, block $3.36, wood $3.72, block $3.41; E. H. Vare, wood, $3.49, block $3.19; Millard Construction Co., wood $3.64, block $3.19.

Bids were also received for furnishing and laying wood and granite blocks, where foundations have already been laid, as follows: Barber Asphalt Co., granite $2.73, wood $2.81, granite $3.06, wood $2.81, granite $2.90, wood $2.81, granite $2.67, wood $2.81, granite $2.73, wood $2.65, granite $3.06, wood $2.65, granite $2.90, wood $2.65, granite $2.67, wood $2.65; Mack Paving Co., granite, $2.79, $3.08, $2.91, $2.80; Cunningham Paving Co., granite $2.56, wood $2.87, granite $2.45, wood $2.87, granite $2.51, wood $2.87, granite $2.25, wood $2.87; Owen J. Evers, granite, $2.75; William A. Ryan, granite, $3.10, $3.23, $3.30, $3.41; E. H. Vare, granite, $2.69, wood, $3.00; Filbert Paving Co., granite, $2.80; Millard Paving Co., granite, $2.90, wood, $3.50; O'Rourke Paving Co., granite, $2.82, $3.36, $3.24, $3.04.

SEWERS.

Trenton, N. Y.—A bill has been passed in the legislature authorizing any city or one or more cities or municipalities to unite in constructing and maintaining a sewage disposal plant. Bonds to defray the cost may be issued, regardless of any limitation as to indebtedness provided by law, or to the maximum tax law so far as the interest and sinking fund on such bonds are concerned.

Trenton, N. J.—The court of errors unanimously sustained, Feb. 4, the supreme court's decision allowing Morristown to build its sewage disposal plant in Hanover township. On the ground that the act of 1902 was unconstitutional, the action of the board of sewer commissioners of that town was attacked; also, that a member of the sewerage commission was interested in the land sold to the town; that the scheme had not met the approval of the State sewerage commission, and that the election at which it was adopted was illegal. All of these attacks were set aside by the supreme court.

CONTEMPLATED WORK.

Caro, Mich.—Surveys are being made for a sewerage system.

Blair, Mich.—The construction of a sewerage system is contemplated.

Rugby, N. Y.—Council is considering a sewerage proposition.

Milton, Pa.—Plans have been approved for constructing a sewage disposal plant.

Hartshorne, Okla.—Plans have been prepared for constructing a sewerage system.

Ft. Smith, Ark.—The extension of the sewer mains is contemplated.

Bartow, Fla.—Plans have been accepted for constructing a sewerage system.

Washington, Pa.—The construction of a sewerage system is proposed.

Murfreesboro, Tenn.—The construction of a sewerage system is contemplated.

Des Moines, Ia.—The construction of a sewer 2 miles long is contemplated.

Waupaca, Wis.—Will vote on the issue of bonds for constructing a sanitary sewer.

Havelock, Neb.—The question of constructing a sewerage system may be voted on.

Belleville, Ill.—An ordinance has been adopted for constructing the Irish Pond sewer.

Cassopolis, Mich.—The question of constructing a sewerage system is being considered.

Louisville, O.—Plans are about completed for constructing a sewage purification plant.

Pittsburg, Pa.—Immediate steps will be taken toward building a sewage disposal plant.

Imperial, Cal.—Will vote on the issue of bonds for constructing a sewerage system.

Hammond, Ind.—Plans are being prepared for extending the sewer in Columbia st. to the river.

Attleboro, Mass.—The estimated cost of constructing a sewerage system is about $300,000.

Bessemer, Ala.—Mayor Rush recommends the construction of a storm sewer for South Bessemer.

Indiana, Pa.—The town council is considering the question of constructing a sewage disposal plant.

Houston, Tex.—Bids will be asked for soon for installing a drainage sewerage system and sanitary sewers.

Mineral Wells, Tex.—This city has decided to expend $15,000 for constructing sewers.

Charleston, S. C.—The estimated cost of completing the sewerage system is placed at $300,000.

Corona, Cal.—Plans and estimates are being prepared for constructing storm drains and sewers.

Chadron, Neb.—Plans and specifications have been completed for constructing a sewerage system.

Carrollton, Ill.—The installation of a combined sanitary sewer and storm system is contemplated.

Hillsboro, Ill.—Bids will be asked about June 1 for constructing a gravity sewer. E. L. Bond, engr.

Lenox, Mass.—The estimated cost of constructing sewers is $20,000. J. M. Johnson, chmn. sewer com.

Chicago, Ill.—Plans have been submit-

ted to Mayor Busse for a comprehensive sewage disposal system.

Chandler, Okla.—The question of issuing $25,000 bonds for constructing a sewerage system will be voted on March 9.

Lafayette, Ind.—The question of constructing sewers in Congress and Alabama sts. is under consideration.

Mitchell, S. D.—Council will consider the extension and improvement of the sewerage system. A septic tank is proposed.

Bordentown, N. J.—Plans for a sewerage system and disposal plant have been approved by the State board of health.

Manistee, Mich.—Bids will be received about March 1 for constructing crock tile sewers. James E. Craig, cy. engr.

Amory, Miss.—Special.—J. P. Johnson says the construction of sewerage and water works systems is contemplated.

Rochester, N. Y.—An ordinance was adopted Feb. 9 for constructing an overflow channel from the East Side trunk sewer.

Grand Forks, N. D.—Plans are being prepared for constructing a sewer in De Hers ave. at a cost of $40,000 to $50,000.

Sterling, Kan.—Bids will be received about April 1 for constructing a sewer, automatic flush tanks and septic tank filter bed.

Atlanta, Ga.—The question of issuing bonds for the construction of sewers and other improvements will be voted on April 7.

New Britain, Conn.—This city contemplates constructing about 6 miles of sanitary sewers and storm drains. F. H. Oldershaw, cy. engr.

River Rouge, Mich.—The sewerage system is to be extended to the Labadie, Noiman, Myers and the Burke and Riopelle subdivisions.

St. Joseph, Mo.—Special.—Bonds have been issued for constructing main sewers, installing a police and fire signal system.

Cheboygan, Mich.—This city contemplates constructing extensive improvements and additions to the present sewerage system. Geo. Case, cy. clk.

Detroit, Mich.—Park Comr. Hinchman will petition the park board for $40,000 to install a sewerage system on Belle Isle, including a pumping station.

Bridgeport, Conn.—John M. Farley, cons. engr., of New York City, has made a proposition to this city to devise an entirely new sewage disposal system.

Aurora, Ill.—About $60,000 will be expended in the construction of sewers this year. Bids will be asked in April for the construction of sewers in the southern portion of the city.

Chicago, Ill.—The construction of an experimental plant for the purification of sewage on the banks of the Calumet river is under consideration by the sanitary district.

Bellingham, Wash.—The extension of the sewer from the end of Champion st. up Whatcom Creek 1 mile is contemplated. The sewer will be of reinforced concrete. Bids will be asked soon. H. W. Troutman, cy. engr.

CONTRACTS TO BE LET.

Humboldt, Ia.—Bids are asked until March 9 for constructing a ditch. J. G. Devine, co. audt.

Emmetsburg, Ia.—Bids are asked until March 3 for constructing ditches. Sim R. Stedman, co. audt.

Wayne, Neb.—Bids are asked until March 22 for constructing a sanitary sewerage system. Marvin Ringer, cy. clk.

Goshen, Ind.—Bids are asked until March 6 for constructing the Hoover drain. J. H. Whetten, drainage comr.

Newburg, N. Y.—Bids are asked until March 2 for constructing a sewer in Robinson ave. with laterals. Cy. clk.

Grundy Center, Ia.—Bids are asked until March 8 for constructing a sanitary sewerage system. Chas. T. Regers, cy. clk.

St. Louis, Mo.—Bids are asked until March 2 for constructing sewers in several sewer districts. W. B. Dryden, sec. B. P. I.

Louisville, Ky.—Bids are asked until March 5 for constructing section B of the Castlewood sewer, contract 26. J. B. Breed, ch. engr.

Lawrence, Kan.—Sealed bids are asked until 5 p. m. March 1 for constructing a main sewer in Maryland st., North Lawrence. F. D. Brooks, cy. clk.

Carmi, Ill.—Sealed bids are asked until March 6 for constructing a drainage ditch in dist. No. 3. John M. Berry, chmn. drainage commrs., Cottage Grove, Ill.

Avalon, N. J.—Bids are asked until March 5 for furnishing and constructing 7400 lin. ft. of terra cotta sewer, 10 manholes and 6 flush boxes. R. L. Goff, boro engr., Ocean City, N. J.

Clermont, Ind.—Sealed bids are asked until March 13 for constructing vitrified pipe sewers, concrete tanks, walls, filters and all necessary apparatus for the completed sewage purification plant. Bd. of trustees Indiana Girls' School; R. L. Sackett, engr., Purdue University, Lafayette.

CONTRACTS AWARDED.

Louisville, Ky.—The contract for constructing the St. Xavier st. sewer was awarded to Coupe & Gray, Feb. 9.

Knoxville, Tenn.—The contract for constructing 8 sections of sewers was awarded to John L. O'Connor, for $14,368.25.

Sylvania, O.—A contract for constructing 7,938-ft. of sewer has been awarded to Lewandowski & Graybowski, of Toledo.

Brady, Tex.—The contract for constructing about 1,600-ft. concrete sewer reinforced with steel was awarded to A. Lewis.

Parkersburg, W. Va.—The contract for constructing sewers in the 7th and 8th wards was awarded to R. T. Martin for $5,919.

Knoxville, Tenn.—The contract for constructing 1,000-ft. of lateral sanitary sewer in Wells ave. was awarded to Jas. A. Hannifin.

Niagara Falls, N. Y.—The contract for constructing an extension to the tunnel trunk sewer has been awarded to Tearney & Horn, of this city, for $65,517.

San Francisco, Cal.—The contract for constructing the southerly section of the East Potrero intercepting sewer was awarded to the Eureka Construction Co. for $98,209.

Marion, Kas.—The contract for constructing 2½-mis. of main and lateral sewers was awarded, Feb. 2, to the Squire Electric & Construction Co., 614 Wyandotte st., Kansas City, Mo.

Springfield, Ill.—The contract for constructing sewers in 5th and 4th sts. was awarded to John Spence, of this city, at 79 cts. for 18-in. pipe; 40 cts. for 12-in. inlet pipe; 83 and 39 cts. for 12-in. inlet pipe.

Tonawanda, N. Y.—The contract for constructing the Gaston sewerage system has been awarded as follows: Lifting station, Great Lakes Construction Co., of Buffalo, $1,946; sewerage system, Lawrence Schultz, of Fredonia, $18,477.

Birmingham, Ala.—Sewer contracts have been awarded as follows: First section, Contractor Turner; 2nd section, Dunn & Lallande; 3rd, 4th, 5th, 6th and

7th sections, C. M. Burkhalter. The total cost of the sewers will be about $240,000.

Tacoma, Wash.—N. Maruce was awarded the contract for constructing sanitary terra cotta sewers in districts No. 175 for $15,234, and in No. 184 for $1,725.42. Gilluci & Varome secured the contract for building a sewer in district 183 for $1,172.

Brooklyn, N. Y.—The contract for constructing a temporary sewer and appurtenances at Ridgewood, to connect with St. Nicholas ave. sewer, thence through Grove st. to the Wyckoff ave. sewer in this borough, and a pumping plant for the same, was awarded, Feb. 3, to Charles Read, for $5,635.

College Hill, O.—The contract for constructing sewers in a number of streets was awarded, Feb. 8, to Walter S. Hollander, as follows: 520 cu. yd. extra excav., 50 cts.; 100 cu. yd. concrete, $5; 1,000 lin. ft. 6-in. sewer pipe, 60 cts.; 6,000 lin. ft. 8-in. sewer pipe, 70 cts.; 13,000 lin. ft. 10-in. sewer pipe, $1; 2,000 lin. ft. 12-in. sewer pipe, $1; 5 tons iron pipe, $80 15 flusher manholes, ea. $6; 50 oval manholes, ea. $30; 30 round manholes, ea. $35; 300 6x8-in. Y branches, 30 cts.; 500 6x10-in. Y branches, 40 cts; 50 6x12-in. Y branches, 55 cts.; total, $25,992. The lowest bid opened same time for a sewer in Fellis ave. was submitted by the Martin Construction Co., of Cincinnati, for $7,473.

WATER WORKS.

Netcong, N. J.—The property owners have petitioned the mayor and council to call a special meeting to vote on the question of purchasing the Rockland Water Company's plant.

Knoxville, Tenn.—The Knoxville Water Co. has made a proposition to this city to sell its plant for $1,250,000. The committee to whom the proposition was made is unwilling to give that sum of money, and will engage Owen Ford, consulting engineer, who drew the plans for a new plant, to make a further examination as to the value of the plant.

CONTEMPLATED WORK.

Perry, Ga.—A water-works system is proposed here.

Bryson City, N .C.—A water-works system is contemplated.

Earlham, Ia.—Voted to issue bonds for constructing water works.

Newton, Ala.—Voted to issue bonds for constructing a water-works system.

Takoma Park, Md.—Council is considering the matter of installing water meters.

Walkersville, Md.—A company has been formed to construct a water-works system.

Iowa City, Ia.—The Iowa City Water Works Co. contemplates constructing a filter plant.

Croghan, N. Y.—Estimates and surveys for water-works system have been completed.

Findley Lake, N. Y.—The construction of a waterworks system is contemplated.

Niagara Falls, N. Y.—The question of improving the water supply will be voted on March 10.

Tecumseh, Ok. — Special. E. Small, supt. w. w., is in the market for waterworks supplies.

Brewton, Ala.—The installation of an engine and dynamo at the water and light plant is contemplated.

Canajoharie, N. Y.—Voted to expend $150,000 for a new water-works system, using Sprite Creek as a source of supply.

Cohoes, N. Y.—Plans and specifications for the proposed filtration paint will be revised and new bids asked next spring.

Amory, Miss.—Special. J. P. Johnson says the construction of a water-works and sewerage system is contemplated.

Central Falls, R. I.—A resolution has been passed providing for the construction of a 16-in. water main in Broad st. Bd. of ald.

Paris, Tex.—Special. Ed. H. McCuistion advises us that he is in the market for machinery and tools for a filtration plant.

Minneapolis, Minn.—Andrew Rinker, cy. engr., desires to secure an expert hydraulic and mechanical engineer to take charge of the water-works system.

Saginaw, Mich.—A public meeting held Jan. 29 resulted in unanimous indorsement of the findings of the Citizens' Committee favoring rapid sand filtration for the water supply.

Fort Smith, Ark.—Judge Rogers denied the local company, Feb. 1, a restraining order to prevent the city from building new water works instead of purchasing the present plant.

Jellico, Tenn.—At a mass meeting held here Feb. 17 it was voted to ask the Tennessee legislature to allow this city to vote on the issue of bonds for installing a water-works system.

Ogdensburg, N. Y.—Plans are being prepared for abandoning Oswegatchie Creek as a source of water supply and for the construction of a sand filtration plant for purifying the St. Lawrence river and erecting a standpipe for new high pressure mains.

CONTRACTS TO BE LET.

East Milwaukee, Wis.—Bids are asked until March 6 for laying 3,514-ft. of 6-in. water mains.

Shattuck, Ok.—Bids are asked until March 8 for constructing a water-works system. Cy sec'y.

Wichita, Kas.—Sealed bids are asked until March 15 for constructing a waterworks system. R. N. Dorr, cy. clk.

Stevensville, Mont.—Bids are asked until March 25 for constructing a waterworks system. Geo. T. Baggs, town clk.

Muskego, Wis.—Bids are asked until March 15 for furnishing a low service pump and a tubular boiler. Morgan Caraway, cy. clk.

Philadelphia, Pa.—Bids are asked until March 15 for constructing a new filtration plant at Queen Lane Pumping station for supplementary supply, including 26 final filters and 54 preliminary filters. Dept. pub. wks.

Kansas City, Mo.—Bids are asked until March 11 for constructing pumping engines. S. J. Armstrong, secy. bd. finc. and water comrs.

Berlin, Md.—Bids are asked until March 16 for constructing a water works and electric light plant. Orlando Harrison, mayor.

Fort Assiniboine, Mont.—Bids are asked until March 4 for a steel water tank and water trestle. J. E. Sawyer, U. S. A., St. Paul, Minn.

Mexico City, Mexico.—Bids are asked until March 10 for furnishing 12,000-tons of c. i. pipe, mainly 4 to 30-in. with some 36 to 48-in.

Petaluma, Cal.—Bids are asked until May 5 for furnishing and installing pumping machinery for salt water high-pressure system. Cy. clk.

Rock Island, Ill.—Sealed bids are asked until 5 p. m. March 1 for constructing a complete mechanical filtration plant. M. T. Rudgren, cy. clk.

Waukesha, Wis.—Bids are asked until March 4 for furnishing 18,000-ft. c. i. pipe, castings, valves, hydrants, etc. E. Merten, pres. bd. water comrs.

Summit, Ill.—Bids are asked until March 1 for furnishing mechanical equipment for pumping water from a deep well to a tank. Jas. Johnstone, vil. clk.

White Plains, N. Y.—Bids are asked until March 8 for furnishing and installing a mechanical filtration plant. John N. Heoney, supt. bd. water comrs.

Toledo, O.—Bids are asked until March 11 for constructing a c. i. pipe conduit, concrete culvert and gate chamber at creek. Reynold Veit, secy. B. P. W.

Waukesha, Wis.—Bids are asked until March 4 for furnishing c. i. pipe, fittings and special castings, valves, valve boxes and hydrants. Fred Phelps, secy. bd. water comrs.

Aberdeen, S. D.—Sealed bids are asked until March 8 for furnishing water-works supplies, including pipe, crosses, tees, hydrants, valves, etc. F. V. Raymond, cy. audt.

Boston, Mass.—Bids are asked until March 11 for constructing water chambers and installing meters at Fort Warren and Gallups Island. Capt. R. H. Rolfe, 263 Summer st.

Forest Park, Ill.—Sealed bids are asked until 5 p. m., March 1, for furnishing and installing a compound duplex pressure pump of 2,000,000-gals. capacity. Albert C. Roos, vil. clk.

Lebanon, Pa.—Bids are asked until March 11 for enlarging dam No. 2 of the gravity water supply, including 33,000-cu. yds. of earth in the dam abreast and concrete intake tower. T. R. Crowell, cy. engr.

North Arlington, N. J.—Bids are asked until March 3 for furnishing and laying 17,340-ft. 6-in., 6,960-ft. 8-in., 280-ft. 4-in. c. i. bell and spigot pipe, hydrants, valves, etc. Wise & Watson, engrs., Rutherford.

New York City—Bids are asked until March 9 for constructing a portion of the Catskill Aqueduct, consisting of about 1-mi. of tunnel, 2 short stretches of concrete conduit, etc. Bids are asked until March 11 for constructing 5,450-ft. of plain concrete conduit, 2 tunnels. John A. Bensal, prest. bd. water supply.

North Arlington, N. J.—Sealed bids are asked until 8 p. m. March 3 for furnishing 280-lin. ft. 4-in. c. i. B. & S. pipe; 17,340 lin. ft. 6-in. c. i. B. & S. pipe; 6,9 0-lin. ft. 8-in. c. i. B. & S. pipe; 19,000-lbs. specials; 10 4-in. gate valves; 19 6-in. gate valves; 10 8-in. gate valves; 2 automatic air valves; 2 6-in. intake meters. H. C. Bayliss, boro. clk.

CONTRACTS AWARDED.

Dallas, Tex.—The contract for constructing 4-mis. of 18 and 16-in. water mains was awarded to C. W. Olcott for $8,935.47.

Seattle, Wash.—The Sparger Concrete Co. was awarded the contract for laying water mains on Boren ave. N. for $10,749.

DeQueen, Ark.—The contract for constructing a system of water works was awarded to the American Light & Water Co., of Kansas City, Mo.

Minot, S. D.—James Kennedy, of Fargo, N. D., was awarded the contract for constructing a new water-works system was structing a new water works system here for $107,502.

North Arlington, N. J.—The contract for constructing a water works system was awarded Feb. 17 to Edward Sargent, of Kearny, for $20,885.55.

Edgmont, S. D.—The contract for constructing a water-works system was awarded the International Bridge Co., of of Tecumseh, Neb., for $17,850.

Beaver, Pa.—George S. McFall was awarded the contract for constructing an addition to the pumping station and installing a pump and gas engine, for $9,669. The contract for constructing the water tower station in South Gay st. for the high-pressure fire service pipe line was awarded to Joseph Schamberger, for $23,-890.

Richmond, Va.—The contract for constructing a 54-in. circular reinforced concrete conduit was awarded to the Piedmont Construction Co., of Atlanta, Ga., for $56,000.

Baltimore, Md.—The contract for constructing water towers and a tank at the sewage disposal works on Back river was awarded to Horace E. Horton, of Chicago, for $7,000.

New Brunswick, N. J.—The contract for furnishing 8,000-ft. of 6 and 8-in. iron pipe and 1,200-ft. of 20-in. pipe was awarded to M. J. Drummond & Co., of New York City, at $12.97 per ton.

Avonmore, Pa.—Contracts for constructing water works were awarded, Feb. 8, as follows: General contract to M. Bennett's Sons, Indiana, Pa.; pumps and gas engine to N. C. Davison Co., Pittsburg, Pa.; c. i. pipe to U. S. C. I. Pipe & Fdry. Co., Pittsburg, Pa., and fire hydrants to Darling Pump Co., Williamsport, Pa. Total Cost about $35,000. Engineer, Robt. H. Wilson, of Saltsburg.

BRIDGES.

Milo, Me.—This city contemplates the construction of a bridge over Piscataquis river.

Columbus, O.—Bids are asked until March 9 for constructing bridges. F. M. Sayre, co. audt.

Faulkton, S. D.—Bids are asked until March 2 for building steel bridges. W. H. Race, co. audt.

Paris, Ark.—Bids are asked until March 4 for constructing a number of bridges. J. W. Castleberry, co. judge.

Spokane, Wash.—New estimates have been submitted by the city engineer for the proposed bridge at Oliva ave.

Chehalis, Wash.—Bids are asked until March 3 for constructing a steel bridge across Tilton river, at Morton, Wash.

Cleveland, O.—Bids are asked until March 13 for constructing concrete bridges and arches. Wm. F. Black, clk. co. comrs.

Liberty, Ind.—Bids are asked until March 1 for constructing a concrete arch bridge on Snowden road. Clinton Gardner, co. audt.

Zanesville, O.—Bids are asked until March 8 for constructing a highway bridge over Meigs Creek in Meigs twp. L. E. Broisford, co. audt.

Cleveland, O.—Bids are asked until March 16 for constructing a steel bridge at Mastick road, over Rocky River. Wm. F. Black, clk. co. comrs.

New Castle, Ind.—Bids are asked until 10 a. m. March 1 for constructing 1 new bridge and reconstructing 1 old bridge. W. L. Risk, co. audt.

Tacoma, Wash.—H. J. McGregor, comr. pub. wks., advocates replacing all old wooden bridges now in use with permanent reinforced concrete structures.

Harrisonburg, La.—Bids are asked until April 5 for constructing a steel bridge at Bushley Bayou, and for repairing a bridge. H. W. Bothard, clk. Police Jury.

Saybrook, Conn.—Plans have been completed for a bridge to be constructed over the Connecticut river between Old Lyme and Old Saybrook.

Indianapolis, Ind.—City council will be asked to appropriate $20,000 for new bridges at the 30th st. crossing of the canal and the Emerson ave. crossing of Pleasant Run.

Bethlehem, Pa.—Will vote March 9 on the question of building a bridge to replace the present covered bridge over the Normanskill on the Scotland plank road.

Woodstown, N. J.—Bids are asked until March 8 for constructing a steel superstructure of a bridge over Salem Creek, near here. Br. com. of bd. chosen freeholders.

STREET LIGHTING.

Camden, Ala.—An electric light plant is contemplated.

Iberville, Que.—Voted to construct an electric light plant.

Arapahoe, Neb.—Voted to issue bonds for constructing an electric light plant.

Anadarko, Ok.—Voted to issue bonds for improving the electric light plant.

Fairmont, Neb.—The Fairmont Water Co. has decided to install an electric light plant.

Victor, N. Y.—The question of constructing an electric light plant is under consideration.

Shoals, Ind.—An electric light franchise has been granted to James F. Lynch, of Danville, Ind.

Pineville, Ky.—Bids will be asked for soon for constructing an electric light plant. B. H. Broughton, cy. clk.

Canal Dover, O.—Plans and specifications have been completed for constructing a municipal electric light plant.

Tacoma, Wash.—Plans for constructing the city power generating plant will be made by Frank C. Kelsey, cons. engr., of Portland.

Lansdowne, Pa.—Bids are asked until March 20 for lighting the streets for 5-yrs. Also for 10-yrs. John W. Davis, secy. boro coun.

Oconomowoc, Wis.—Plans are being prepared for improving and enlarging the municipal electric light plant. F. R. Hubbard, engr.-in-charge.

Milwaukee, Wis.—Bids are asked until March 5 for lighting parks and parkways with naptha or other illuminants for 3 to 5 yrs. Daniel Erdman, chmn. park bd.

Turon, Kan.—Charles McMurray contemplates establishing an electric light plant here, and desires to communicate with manufacturers of equipment and machinery for the plant.

Ft. Yellowstone, Wyo.—Bids are asked until March 13 for 3 water turbines, with governors, 3 generators and 3 exciters, with switchboard and connections, etc. Lieut. G. C. Smith, constr. Q. M.

Sumter, S. C.—Bids are asked until March 9 for furnishing 50 enclosed incandescent arc lights, 6. amperes, 2,000 nom. c. p.; also 50 to 80 additional lights, 10-year contract. C. M. Hurat, cy. clk.

Philadelphia, Pa.—Plans have been approved for lighting Market, Broad, Walnut, Chestnut, Spruce, Arch and other streets with electricity. Ornamental poles and electric lights of high candle power are contemplated. John E. Ryburn, mayor.

GARBAGE DISPOSAL, STREET CLEANING AND SPRINKLING.

Baltimore, Md.—The contract for furnishing 15 new garbage carts has been awarded to F. T. Lynch for $2,095.

Milwaukee, Wis.—Bids are asked until March 31 for erecting a refuse incineration plant. Chas. J. Poetsch, chmn. B. P. W.

Youngstown, O.—City council is considering the erection of a municipal garbage reduction and disposal plant next summer.

Jacksonville, Fla.—Bids are asked until March 2 for constructing a garbage and refuse plant. N. C. Wamboldt, chmn. B. P. W.

Sandusky, O.—Bids are asked until March 15 for the collection of garbage and offal, dead animals, etc. John J. Molter, prest. bd. of health.

Paris, Tex.—Special. Ed. H. McCuistion advises us that he is in the market for machinery and tools for an abattoir, reduction plant, etc.

Sacramento, Cal.—The city engineer has submitted plans and specifications for an additional unit to the city garbage crematory. The plans have been adopted.

PARKS.

Memphis, Tenn.—This city contemplates issuing $1,000,000 worth of bonds for park purposes.

Hamilton, O.—The city council has appropriated $3,500 for preparing plans for a system of parks.

Havre, Mont.—This city has been presented with some land and will improve it as a park in the spring.

Ft. Wayne, Ind.—The city council committee on parks has recommended an appropriation of $10,500 for the purchase of the Weissor Grove for park purposes.

Quincy, Ill.—The Quincy Park and Boulevard Association has completed negotiations for land for a driveway to connect Riverview Park and Sunset Heights. About 15,000 trees and shrubs are to be set out in the spring in Gardner Park and in the improvements at Rogers Clarke Terrace.

FIRE APPARATUS.

Plymouth, Wis.—City council voted to install the Gamewell fire alarm system.

St. Joseph, Mo.—Special. Bonds have been issued for installing a police and fire signal system.

Indianapolis, Ind.—An ordinance has been passed appropriating $2,440 for the purchase of a new fire truck.

Viroqua, Wis.—The city council and the fire department are planning for the purchase of a fire alarm system.

Wessington, S. D.—A fire company is being organized, and ladders, trucks and other equipment will be purchased.

McIntosh, S. D.—A volunteer fire department will be organized and chemical engines and other fire apparatus purchased.

Maplewood, N. J.—Bids are asked until 8 p. m., March 2 for furnishing South Orange twp. with rubber, canvas-covered hose. W. H. Kemp, chmn. twp. com.

Coeur d'Alene, Idaho.—Council has awarded a contract for a fire alarm system to the Gamewell Fire Alarm Telegraph Company, of New York City, for $5,300.

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NOTICE OF EXAMINATION OF APPLICANTS FOR THE POSITION OF SUPERVISOR OF THE WATER WORKS, MINNEAPOLIS, MINN.

Minneapolis, Minnesota, Feb. 15, 1909.

The undersigned, Board of Examiner, appointed by the City Council of the City of Minneapolis, Minnesota, hereby give notice that an examination in hydraulic and mechanical engineering will be held in the office of the City Engineer on March 15, 1909, at 10 a. m., to examine candidates for the position of Supervisor of the Water Works in the Water Department of the City of Minneapolis, Minnesota.

Andrew Rinker,
Frederick H. Bass,
F. W. Cappelen,
Board of Examiners.

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